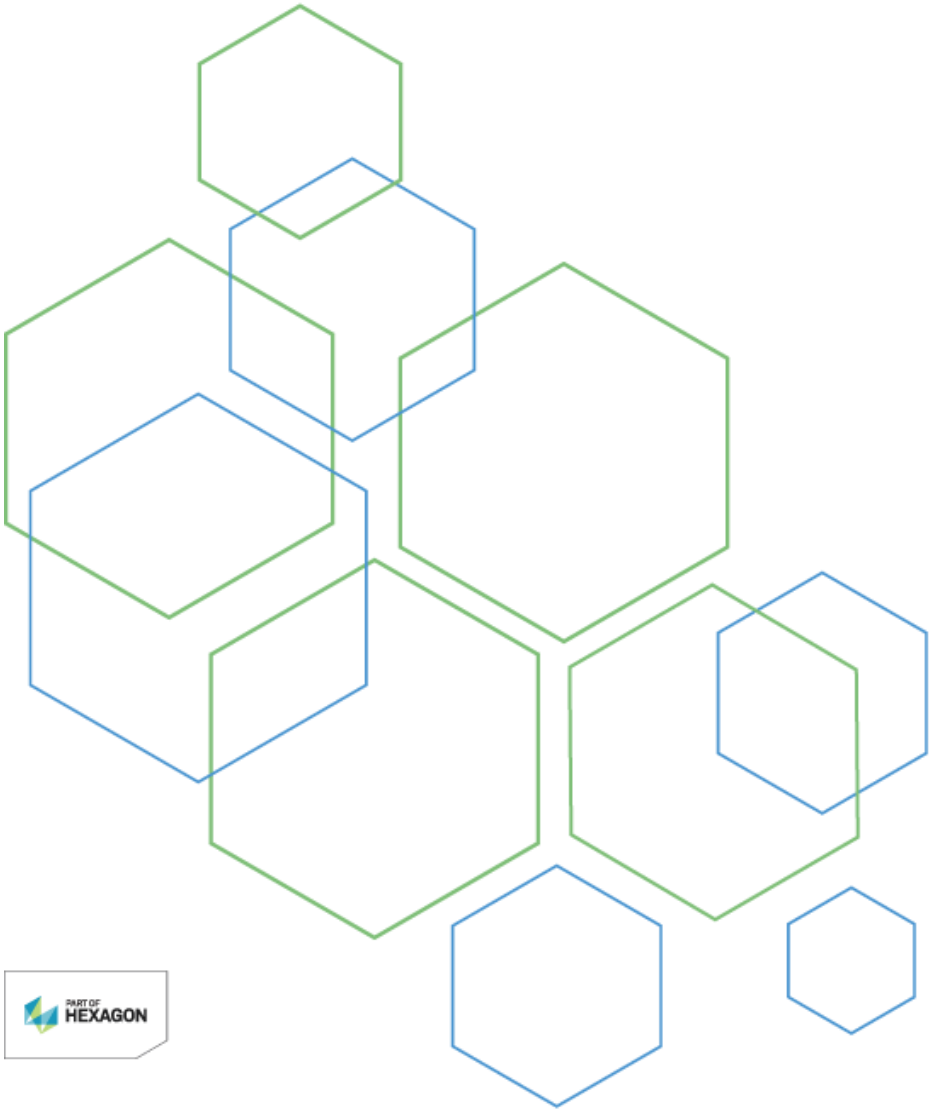
INTERGRAPH Smart 3D

Grids

User's Guide



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Contents

Preface **6**

What's New in Grids **6**

Grids **7**

Grids Workflow **9**

Grids Common Tasks 9
Selecting Objects 10
Grids Naming Rules 12

Grid Wizard **18**

Create Coordinate System (Grid Wizard) 18
Create Elevation Planes (Grid Wizard) 20
Create Grid X-Planes (Grid Wizard) 22
Create Grid Y-Planes (Grid Wizard) 24
Create Radial Cylinder (Grid Wizard) 26
Create Radial Planes (Grid Wizard) 28
Associated Elevation Planes (Grid Wizard) 30

Import and Export Coordinate Systems **31**

Import Grids 31
Import coordinate system 31
General Tab (Import Grids Dialog Box) 32
Settings Tab (Import Grids Dialog Box) 32
Export Grids 33
Export coordinate system 33
General Tab (Export Grids Dialog Box) 33
Settings Tab (Export Grids Dialog Box) 34

Place Coordinate System **35**

Place a coordinate system 38
Copy a coordinate system 39
Edit coordinate system properties 39
Move a coordinate system origin 40
Edit a coordinate system name 41
Modify coordinate system bearing 41
Delete a coordinate system 41
Coordinate System Properties Dialog Box 41
General Tab (Coordinate System Properties Dialog Box) 42
Configuration Tab 43
Relationship Tab 45

Place Coordinate System by Three Points 46

Place a coordinate system by three points 48

Place Elevation Planes 50

Place elevation plane 52
Place multiple elevation planes 52
Copy elevation plane 52
Edit elevation plane properties 53
Change elevation plane type 53
Modify elevation plane position 53
Edit elevation plane name 54
Delete elevation plane 54
Elevation Planes Properties Dialog Box 55
General Tab (Elevation Plane Properties Dialog Box) 55

Place Grid Planes 57

Place a grid plane 60
Place multiple grid planes 60
Copy a grid plane 60
Rotate a grid plane 61
Modify grid plane position 62
Edit grid plane properties 63
Edit grid plane name 63
Edit grid plane nesting level 63
Change grid plane type 64
Delete a grid plane 64
Delete a grid line 64
Regenerate grid lines 64
Grid Plane Properties Dialog Box 65
General Tab (Grid Plane Properties Dialog Box) 65
Grid Line Properties Dialog Box 67

Place Radial Grids 68

Place a radial plane 70
Place multiple radial planes 70
Copy a radial plane 71
Place a radial cylinder 71
Place multiple radial cylinders 71
Copy a radial cylinder 72
Radial Grid Properties Dialog Box 72
General Tab (Radial Grid Properties Dialog Box) 72

Glossary 75

Index 80

Preface

This document is a user's guide for the Grids functionality of Intergraph Smart™ 3D and provides command reference information and procedural instructions.

Documentation Comments

For the latest support information for this product, comments or suggestions about this documentation, and documentation updates for supported software versions, please visit *Intergraph Smart Support* (*https://smartsupport.intergraph.com*).

What's New in Grids

The following changes have been made to the Grids task.

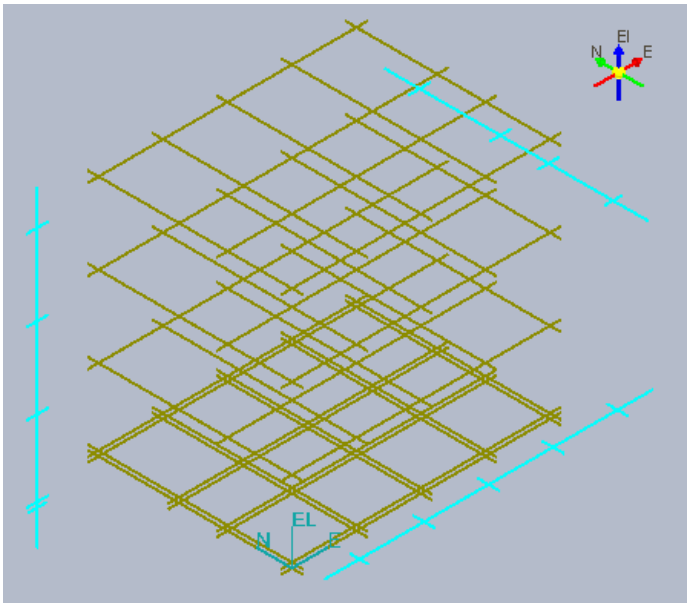
Version 2016 (11.0)

- Added a new locate filter, **Construction Graphics**. For more information, see *Selecting Objects* (on page 10). (P2 CP:271166)

SECTION 1

Grids

The **Grids** task creates and manipulates coordinate systems, elevation planes, vertical grid planes, radial cylinders/planes, grid arcs, and grid lines. Coordinate systems provide a locating scheme when working in the model. The grid lines of a coordinate system represent the relative positioning requirements for a specific design purpose. When designing your model, you may want different coordinate systems for individual pipe racks, buildings, or areas of the model.



When designing your ship, you may want to create a main coordinate system with grid and Z planes every meter. The grid planes and Z planes of this coordinate system would be used to place the major plate systems of the ship such as the decks and bulkheads. You may also want to create separate coordinates systems for individual cargo spaces and machinery spaces to help with the placement of equipment.

The **Grids** task contains the following commands:

	**Select** - Used to select objects in the model. For more information, see *Selecting Objects* (on page 10).
	**Grid Wizard** - Creates a new coordinate system and all the related planes/cylinders in operation. For more information, see *Grid Wizard* (on page 18).
	**Place Coordinate System** - Creates a new coordinate system. For more information, see *Place Coordinate System* (on page 35).
	**Place elevation Planes** - Places elevation planes in the model. For more information, see *Place Elevation Planes* (on page 50).

	**Place Grid Planes** - Places grid planes in the model. For more information, see *Place Grid Planes* (on page 57).
	**Place Radial Grid** - Places radial grid planes in the model. For more information, see *Place Radial Grids* (on page 68).
	**Place Coordinate System by Three Points** - Creates a new coordinate system using three points that you specify in a graphic view. For more information, see *Place Coordinate System by Three Points* (on page 46).

See Also

Grids Common Tasks (on page 9)

SECTION 2

Grids Workflow

For rectangular coordinate systems, use the **Grid Wizard** to create coordinate systems, elevation planes, and grid planes in one process. Then use the **Place Elevation Plane** and **Place Grid Plane** commands or the **Grid Wizard** to add additional planes as needed.

For radial coordinate systems, use the **Grid Wizard** to create coordinate systems, elevation planes, radial cylinders, and radial planes in one process. Then use the **Place Elevation Plane** and **Place Radial Grid** commands or the **Grid Wizard** to add additional planes and radial grids as needed.

See Also

Grids Common Tasks (on page 9)

Grids Common Tasks

You use the following tasks frequently when you create grids.

Grid Wizard Command

- Defines coordinate systems, elevation planes, vertical grid planes, radial cylinders, and radial planes in a single process using the **Grid Wizard** command. For more information, see *Grid Wizard* (on page 18).

Place Coordinate Systems

- Places coordinate systems in the model. For more information, see *Place a Coordinate System* (on page 38).

Place Elevation Planes

- Places elevation planes in the model. For more information, see *Place elevation plane* (on page 52).

Place Grid Planes

- Places grid planes in the model. For more information, see *Place a Grid Plane* (on page 60).

Place Radial Grids

- Places radial cylinders in the model. For more information, see *Place a Radial Cylinder* (on page 71).
- Places radial grid planes in the model. For more information, see *Place a Radial Plane* (on page 70).

Selecting Objects

Most objects in the **Grids** task have properties that you can edit. Use the **Select** command on the vertical toolbar to select the object that you want to edit. Grid lines and grid arcs do not have properties that you can edit.

An important part of the **Select** command is the **Locate Filter** box that appears on the ribbon. It contains the available, predefined filters for the **Select** command. When you choose a filter in the **Locate Filter** box, the software limits your selections to the filtered objects in both the graphic view and the **Workspace Explorer**. For example, if you select as a filter **Elevation Plane**, you can select only elevation planes in the graphic view or in the **Workspace Explorer**.

NOTE You can also create a filter to display only the grid lines on specific elevation planes.

The **Grids** task includes these filters:

Axis

Limits your selection in the graphic view or in the **Workspace Explorer** to the three-axes of the coordinate system.

Construction Graphics

Limits the selection of items to construction graphics.

Control Points

Limits your selection in the graphic view or in the **Workspace Explorer** to control points.

Coordinate System

Limits your selection in the graphic view or in the **Workspace Explorer** to coordinate systems. You can place coordinate systems using the **Place Coordinate System** command. For more information, see *Place Coordinate System* (on page 35).

Elevation Plane

Limits your selection in the graphic view or in the **Workspace Explorer** to elevation planes. You can place elevation planes using the **Place Elevation Plane** command. For more information, see *Place Elevation Planes* (on page 50).

Grid Arc

Limits your selection in a graphic view to grid arcs. Grid arcs represent the intersection of an elevation plane and a radial cylinder.

Grid Line

Limits your selection in the graphic view to grid lines. Grid lines represent the intersection of an elevation plane and either a grid plane or a radial plane.

Grid Plane

Limits your selection in the graphic view or in the **Workspace Explorer** to grid planes. You can place grid planes using the **Place Grid Plane** command. For more information, see *Place Grid Planes* (on page 57).

Grids Entities

Allows you to select coordinate systems, grid lines, grid arcs, elevation planes, vertical grid planes, radial cylinders, and radial planes in the graphic view and in the **Workspace Explorer**. Objects placed using other tasks, such as equipment, cannot be selected using this filter.

Radial Cylinder

Limits your selection in the graphic view or in the **Workspace Explorer** to radial cylinders. You can place radial cylinders using the **Place Radial Grid** command. For more information, see *Place Radial Grids* (on page 68).

Radial Plane

Limits your selection in the graphic view or in the **Workspace Explorer** to radial planes. You can place grid planes using the **Place Radial Grid** command. For more information, see *Place Radial Grids* (on page 68).

All

Allows you to select any object, even objects created in another task.

More

Opens the **Select Filter** dialog box. The **Select Filter** dialog box displays all of the simple filters that are set up to accept object type or system objects as discrimination data. You can then select additional filters to add them to this list. Only the selection of filters is available; all other options are disabled. For more information, see Select Filter Dialog Box in the *Common User's Guide*.

 **Inside**

Specifies that all objects located entirely inside the fence be selected. This setting is the default for the **Select** command.

 **Inside/Overlapping**

Specifies that all objects located entirely inside the fence and those outside the fence but touching the fence at some point are selected.

See Also

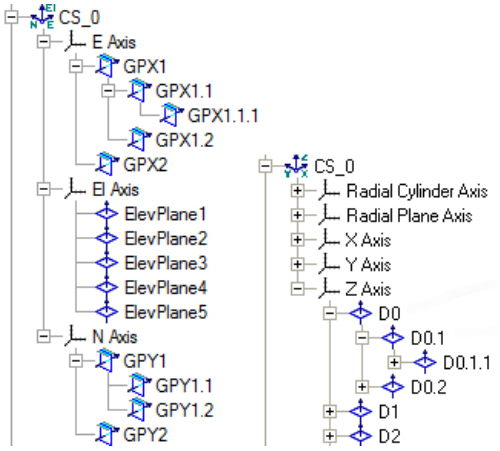
Grid Line Properties Dialog Box (on page 67)
Grid Plane Properties Dialog Box (on page 65)
Radial Grid Properties Dialog Box (on page 72)
Elevation Planes Properties Dialog Box (on page 55)
Coordinate System Properties Dialog Box (on page 41)

Grids Naming Rules

The software provides several options for naming the elevation planes, grid planes, radial cylinders, and radial planes. See the *Smart 3D Reference Data Guide* for information about creating your own naming rules.

Index

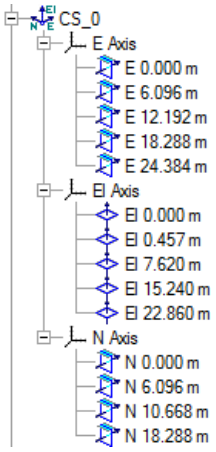
The **Index** name rule uses the position of the plane relative to the other planes to assign the name. The first plane is given the name 1, the second plane 2, the third plane 3, and so forth. The secondary planes are suffixed with an additional decimal indication of the sequential order, and so forth for tertiary planes.



Plane Type	Plant	Ship	Example
Elevation Plane	ElevPlane	D	ElevPlane1, ElevPlane 2, ElevPlane 3 D1, D2, D3, D4
X-axis Perpendicular	GPX	F	GPX1, GPX2, GPX3, GPX4 F1, F2, F3, F4
Y-axis Perpendicular	GPY	L	GPY1, GPY2, GPY3, GPY4 L1, L2, L3, L4
Radial Cylinders	C	C	C1, C2, C3, C4
Radial Planes	R	R	R1, R2, R3, R4

Position

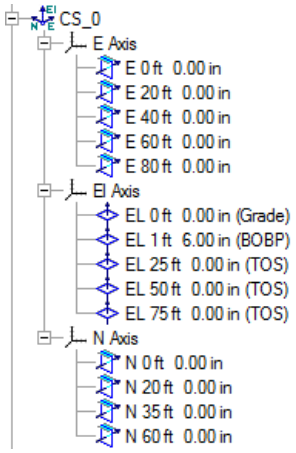
The **Position** name rule uses the physical position of the plane for the name of the plane. The position is relative to the origin of the coordinate system to which the plane belongs. The position is always displayed in meters, regardless of the session working units.



Plane Type	Plant	Ship	Example
Elevation Plane	El	D	El -3.00m, El 3.00 m, El 6.00m D - 3.00m, D 3.00 m, D 6.00m
X-axis Perpendicular	E	F	E -3.00, E 3.00 m, E 6.00m F -3.00, F 3.00 m, F 6.00m
Y-axis Perpendicular	N	L	N -3.00m, N 3.00 m, N 6.00m L -3.00m, L 3.00 m, L 6.00m
Radial Cylinders	C	C	C 3.0m, C 6.0m, C 9.0m
Radial Planes	R	R	R 15deg, R 30deg, R 45deg

Imperial Position

The **Imperial Position** name rule uses the physical position of the plane for the name of the plane. The position is relative to the origin of the coordinate system to which the plane belongs. The position is always displayed in feet and inches, regardless of the session working units.



Plane Type	Plant	Ship	Example
Elevation Plane	EL	Z	EL 0ft 0.00in (Grade), EL 15ft 0.00in (TOS), EL 18ft 0.00in (Splice) Z 1ft 0.00in, Z 3ft 6.00in, Z 9ft 10.00in
X-axis Perpendicular	E	X	E -3ft 0.00in, E 3ft 0.00in, E 6ft 5.00in X -3ft 0.00in, X 3ft 0.00in, X 6ft 5.00in
Y-axis Perpendicular	N	Y	N -3ft 0.00in, N 3ft 0.00in, N 6ft 8.00in Y -3ft 0.00in, Y 3ft 0.00in, Y 6ft 0.00in
Radial Cylinders	C	C	C 15ft 0.00in and C 30ft 0.00in
Radial Planes	R	R	R 30.0 deg and R 45.0 deg

Global Position

The **Global Position** name rule uses the physical position of the plane for the name of the plane. The position is relative to the origin of the global coordinate system. The position is always displayed in meters, regardless of the session working units.

Plane Type	Plant	Ship	Example
Elevation Plane	EL	D	El -3.00m, El 3.00 m, El 6.00m D - 3.00m, D 3.00 m, D 6.00m
X-axis Perpendicular	E	F	E -3.00, E 3.00 m, E 6.00m F -3.00, F 3.00 m, F 6.00m

Plane Type	Plant	Ship	Example
Y-axis Perpendicular	N	L	N -3.00m, N 3.00 m, N 6.00m L -3.00m, L 3.00 m, L 6.00m
Radial Cylinders	C	C	C 3.0m, C 6.0m, C 9.0m
Radial Planes	R	R	R 15deg, R 30deg, R 45deg

Imperial Global Position

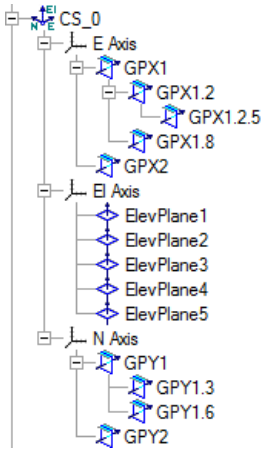
The **Imperial Global Position** name rule uses the physical position of the plane for the name of the plane. The position is relative to the origin of the global coordinate system. The position is always displayed in feet and inches, regardless of the session working units.

Plane Type	Plant	Ship	Example
Elevation Plane	EL	Z	EL 0ft 0.00in (Grade), EL 15ft 0.00in (TOS), EL 18ft 0.00in (Splice) Z 1ft 0.00in, Z 3ft 6.00in, Z 9ft 10.00in
X-axis Perpendicular	E	X	E -3ft 0.00in, E 3ft 0.00in, E 6ft 5.00in X -3ft 0.00in, X 3ft 0.00in, X 6ft 4.00in
Y-axis Perpendicular	N	Y	N -3ft 0.00in, N 3ft 0.00in, N 6ft 8.00in Y -3ft 0.00in, Y 3ft 0.00in, Y 6ft 0.00in
Radial Cylinders	C	C	C 15ft 0.00in and C 30ft 0.00in
Radial Planes	R	R	R 30.0 deg and R 45.0 deg

Index and Percent

The **Index and Percent** name rule uses the position of the plane relative to the other planes to assign the name. The first primary plane is given the name 1, the second primary plane 2, the third primary plane 3, and so forth. The secondary planes are suffixed to the primary plane with a decimal indicator. The number to the right of the decimal indicator is the relative position between the previous primary plane and the next primary plane, expressed as a percentage. For example, if the secondary plane is directly between the two primary planes, .5 is the suffix. The

locations of the tertiary plane are suffixed to the secondary plane location using the same method.

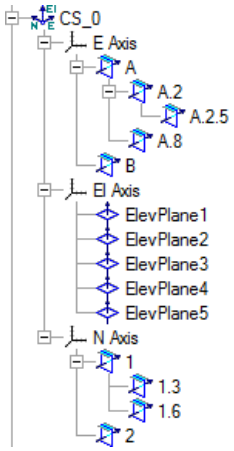


Plane Type	Plant	Ship	Example
Elevation Plane	not available	not available	
X-axis Perpendicular	GPX	F	GPX1, GPX2, GPX3 F1, F2, F3
Y-axis Perpendicular	GPY	L	GPY1, GPY2, GPY3 L1, L2, L3
Radial Cylinders	C	C	C1, C2, and C3
Radial Planes	R	R	R1, R2, and R3

Alphanumeric and Percent

The **Alphanumeric and Percent** name rule uses the position of the plane relative to the other planes to assign the name. The first primary plane is given the name 1 or A, the second primary plane 2 or B, the third primary plane 3 or C, and so forth. The secondary planes are suffixed to the primary plane with a decimal indicator. The number to the right of the decimal indicator is the relative position between the previous primary plane and the next primary plane, expressed as a percentage. For example, if the secondary plane is directly between the two primary planes, .5

is the suffix. The locations of the tertiary plane are suffixed to the secondary plane location using the same method.



Plane Type	Plant	Ship	Example
Elevation Plane	not available	not available	
X-axis Perpendicular	A, B, C	A, B, C	A, A.5, B, C
Y-axis Perpendicular	1, 2, 3	1, 2, 3	1, 1.3, 1.6, 2
Radial Cylinders	C	C	C1, C2, C3
Radial Planes	R	R	R1, R2, R3

User Defined

The **User Defined** naming rule allows you to define the name of the plane. After selecting this naming rule, type the name for the plane in the **Name** box.

SECTION 3

Grid Wizard

Opens a wizard that steps you through the process of creating or modifying design coordinate systems, elevation planes, grid planes, radial cylinders, and radial planes in your model. You then have the option of creating grid lines/grid arcs along the intersections with the elevation planes.

In This Section

Create Coordinate System (Grid Wizard) 18
Create Elevation Planes (Grid Wizard) 20
Create Grid X-Planes (Grid Wizard) 22
Create Grid Y-Planes (Grid Wizard) 24
Create Radial Cylinder (Grid Wizard) 26
Create Radial Planes (Grid Wizard) 28
Associated Elevation Planes (Grid Wizard) 30

Create Coordinate System (Grid Wizard)

Defines the coordinate system with which you want to associate the elevation planes, grid planes, radial planes, and radial cylinders. You create and modify these planes/cylinders later using the wizard. In addition to selecting existing coordinate systems, you can also create a new coordinate system to which you can assign the elevation planes, grid planes, radial planes, and radial cylinders. You then have the option of creating grid lines/arcs along the intersections with the elevation planes.

Name

Defines the name of the coordinate system that you are creating. This coordinate system name will display as the default reference coordinate system in the **Create Elevation Planes**, **Create X-Planes**, **Create Y-Planes**, **Create Radial Cylinder**, and **Create Radial Planes** dialog boxes in the **Grid Wizard**.

System

Select the parent system for the coordinate system that you are creating. The default value is the *Configure Project Root*. You can access other parent systems by clicking the **More...** option.

New Coordinate System

Assigns the elevation planes, grid planes, radial planes, and radial cylinders that you are creating to a new coordinate system with a north arrow and an origin that you define on this page.

Existing Coordinate System

Assigns the elevation planes, grid planes, radial planes, and radial cylinders that you are creating to an existing coordinate system.

Grid Type

Select the type of coordinate system to place. The **Grid Type** property cannot be modified on an existing coordinate system.

- **Grids** - This coordinate system type uses East, North, and Elevation to define the three coordinate system axes. Naming rules for the elevation and grid plane names generally use E, N, and EL. The Z-axis (Elevation) is locked in the up direction. Grid lines are placed by default.
- **Ship** - This coordinate system type uses X, Y, and Z to define the three coordinate system axes. Naming rules for the elevation (Z) and grid plane names generally use F, L, and D. Grid lines are not placed by default but can be placed if you want. The Z-axis is not fixed in any direction so the coordinate system can be rotated about the X- or Y-axis.
- **Coordinate System** - Select **Rectangular**, **Cylindrical**, or **Both** to create a coordinate system with the following planes:

Coordinate System	**Plane**
Rectangular	Elevation/Z-Planes X-Planes Y-Planes
Cylindrical	Elevation/Z-Planes Radial Cylinder Radial Planes
Both	All five types of Planes

Axis for Bearing

Select the X- or Y-axis as the axis to define the coordinate system North.

Bearing

Specifies the bearing angle of the axis that you selected in the **Axis for Bearing** box. This bearing angle is defined with respect to the global coordinate system.

Reference CS

Select the coordinate system in which to define the origin of the coordinate system that you are creating. The **Reference CS** property cannot be modified on an existing coordinate system.

East (X) / X

Specifies the easting or X coordinate of the coordinate system origin. If you are creating the coordinate system, you define this value with respect to the coordinate system that you selected in the **Reference CS** box.

North (Y) / Y

Specifies the northing or Y coordinate of the coordinate system origin. If you are creating the

coordinate system, you define this value with respect to the coordinate system that you selected in the **Reference CS** box.

Up (Z) / Z

Specifies the elevation coordinate of the coordinate system origin. If you are creating the coordinate system, you define this value with respect to the coordinate system that you selected in the **Reference CS** box.

Create Elevation Planes (Grid Wizard)

Defines the settings for the elevation planes that you want to place in the model. You can also modify the **Elevation Plane Locations** options after creating a coordinate system.

Elevation Plane Settings

NOTE You cannot use the **Grid Wizard** to modify these options after initial placement.

Reference CS

Select the coordinate system to reference for the location of the **Start Plane**. The name of the coordinate system set in the **Create Coordinate System** dialog box of the **Grid Wizard** displays by default.

Start plane

Specify the location of the first elevation plane. The location is relative to the **Up (Z)** coordinate in the coordinate system that you specified in the **Reference CS** box. If elevation planes already exist, you can select one from the list. The **Start plane** list allows you to type the text for plane name along with the location information. For example, you can do the following:

- Specify the plane position as **20.00 m**
- Type the text for plane name as **'ElevPlane1'**
- Type the text for plane name along with the plane position as **'ElevPlane1' + 20.00 m**

Copies

Type the number of elevation plane copies to create.

Spacing

Type the spacing between the elevation planes. Be sure to include the units when defining the spacing; for example, ft or m.

End plane

Displays the location of the last elevation plane. You cannot edit this value.

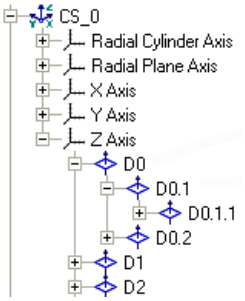
Name rule

Select the name rule that you want to use to name the elevation planes that you are creating. For more information about what each naming rule does, see *Grids Naming Rules* (on page 12).

Nesting level

Defines the nesting level for the elevation plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent planes, a difference of only one level is allowed. Therefore,

secondary planes are only allowed between two primary planes. Similarly, tertiary planes are only allowed between two secondary planes.



Type

Select the type of elevation plane to place. Examples of grids elevation plane types are as follows: Bottom of Base Plate, Bottom of Concrete, Top of Steel, Top of Concrete, Grade Elevation, and Column Splice Elevation. You can define elevation plane types in the reference data.

Add

Adds the defined elevation plane settings to the **Elevation Plane Locations** list.

Elevation Plane Locations

NOTE If you are editing an existing coordinate system, the **Elevation Plane Locations** grid displays existing elevation planes in blue and new elevation planes in black.

Location

Displays the location of the elevation plane relative to its parent coordinate system.

Type

Specifies the type of elevation plane. You can change the elevation plane type if needed.

Name

Displays the name of the elevation plane. You can select and edit the text in the box if needed.

Nesting level

Defines the nesting level for the elevation plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent elevation planes, a difference of only one level is allowed. Therefore, secondary elevation planes are only allowed between two primary elevation planes. Similarly, tertiary elevation planes are only allowed between two secondary elevation planes.

Global Location

Displays the location of the elevation plane relative to the global coordinate system.

Spacing

Specifies the spacing between planes for a project to monitor the relative location of these planes. The first plane is always set to 0.00. For each subsequent plane, the **Spacing** value is its relative distance from the previous plane. This is a read-only value when creating a new coordinate system but can be modified in an existing coordinate system.

NOTE If you edit the **Spacing** value of an existing plane, the plane shifts to the new location as required. In addition, the remaining planes along that axis will also re-locate relative to the new location of the edited plane to maintain their existing **Spacing** values.

Delete

Deletes the selected elevation plane. You cannot delete elevation planes that have already been placed in the model.

Create Grid X-Planes (Grid Wizard)

Creates new grid planes that are perpendicular to the X-axis of the coordinate system. You can also modify existing X-Planes.

Grid X-Plane Settings

NOTE You cannot use the **Grid Wizard** to modify these options after initial placement.

Reference CS

Select the coordinate system to reference for the location of the **Start Plane**. The name of the coordinate system set in the **Create Coordinate System** dialog box of the **Grid Wizard** displays by default.

Start plane

Specify the location of the first grid plane. The location is relative to the **East (X) / X** coordinate of the reference coordinate system. If grid planes already exist, you can select one from the list. The **Start plane** list allows you to type the text for plane name along with the location information. For example, you can do the following:

- Specify the plane position as **20.00 m**
- Type the text for plane name as **'XPlane1'**
- Type the text for plane name along with the plane position as **'GPX1' + 20.00 m**

Copies

Type the number of grid plane copies to create.

Spacing

Type the spacing between the grid planes along the X-axis.

End plane

Displays the location of the last grid plane. You cannot edit this value.

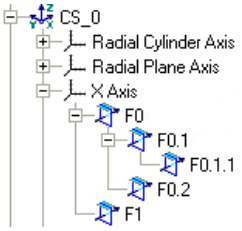
Name rule

Select the name rule you want to use to name the grid planes that you are creating. For more information about what each naming rule does, see *Grids Naming Rules* (on page 12).

Nesting level

Defines the nesting level for the grid plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent grid planes, a difference of only one level is allowed. Therefore, secondary grid planes are only allowed between two primary grid planes.

Similarly, tertiary grid planes are only allowed between two secondary grid planes.



Type

Specifies the type of grid plane. Examples of grid plane types are: E-W Grid Plane, N-S Grid Plane, and Expansion Joint Plane. Examples of Ship plane types are as follows: MidShip or Centerline. You can define grid plane types in the reference data.

Add

Adds the defined grid plane settings to the **Grid X- Plane Locations** list.

Grid X-Plane Locations

NOTE If you are editing an existing coordinate system, the **Grid X-Plane Locations** grid displays existing planes in blue and new planes in black.

Location

Displays the location of the grid plane relative to its parent coordinate system.

Type

Specifies the type of grid plane. You can change the grid plane type if necessary.

Name

Displays the name of the grid plane. You can edit the name by selecting the box and typing a new name.

Nesting level

Displays the nesting level of the grid plane.

Global Location

Displays the location of the grid plane relative to the global coordinate system.

Spacing

Specifies the spacing between planes for a project to monitor the relative location of these planes. The first plane is always set to 0.00. For each subsequent plane, the **Spacing** value is its relative distance from the previous plane. This is a read-only value when creating a new coordinate system but can be modified in an existing coordinate system.

NOTE If you edit the **Spacing** value of an existing plane, the plane shifts to the new location as required. In addition, the remaining planes along that axis will also re-locate relative to the new location of the edited plane to maintain their existing **Spacing** values.

Delete

Deletes the selected grid plane. You cannot delete grid planes that have already been placed in the model.

Create Grid Y-Planes (Grid Wizard)

Creates new grid planes that are perpendicular to the Y-axis of the coordinate system. You can also modify existing Y-Planes.

Grid Y-Plane Settings

NOTE You cannot use the **Grid Wizard** to modify these options after initial placement.

Reference CS

Select the coordinate system to reference for the location of the **Start Plane**. The name of the coordinate system set in the **Create Coordinate System** dialog box of the **Grid Wizard** displays by default.

Start plane

Specify the location of the first grid plane. The location is relative to the **North (Y)** / **Y** coordinate of the reference coordinate system. If grid planes already exist, you can select one from the list. The **Start plane** list allows you to type the text for plane name along with the location information. For example, you can do the following:

- Specify the plane position as **20.00 m**
- Type the text for plane name as **'YPlane1'**
- Type the text for plane name along with the plane position as **'GPY1' + 20.00 m**

Copies

Type the number of grid plane copies to create.

Spacing

Type the spacing between the grid planes along the Y-axis.

End plane

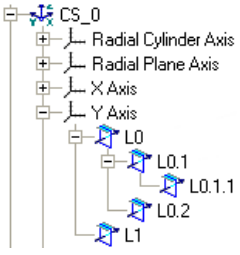
Displays the location of the last grid plane. You cannot edit this value.

Name rule

Select the name rule to use to name the grid planes that you are creating. For more information about what each naming rule does, see *Grids Naming Rules* (on page 12).

Nesting level

Defines the nesting level for the grid plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent grid planes, a difference of only one level is allowed. Therefore, secondary grid planes are only allowed between two primary grid planes. Similarly, tertiary grid planes are only allowed between two secondary grid planes.



Type

Specifies the type of grid plane. Examples of grid plane types are as follows: E-W Grid Plane, N-S Grid Plane, and Expansion Joint Plane. You can define grid plane types in the reference data.

Add

Adds the defined grid plane settings to the **Grid Y- Plane Locations** list.

Grid Y-Plane Locations

NOTE If you are editing an existing coordinate system, the **Grid Y-Plane Locations** grid displays existing planes in blue and new planes in black.

Location

Displays the location of the grid plane relative to its parent coordinate system.

Type

Specifies the type of grid plane. You can change the grid plane type if necessary.

Name

Displays the name of the grid plane. You can edit the name by selecting the box and then typing a new name.

Nesting level

Displays the nesting level of the grid plane.

Global Location

Displays the location of the grid plane relative to the global coordinate system.

Spacing

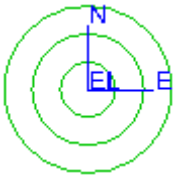
Specifies the spacing between planes for a project to monitor the relative location of these planes. The first plane is always set to 0.00. For each subsequent plane, the **Spacing** value is its relative distance from the previous plane. This is a read-only value when creating a new coordinate system but can be modified in an existing coordinate system.

NOTE If you edit the **Spacing** value of an existing plane, the plane shifts to the new location as required. In addition, the remaining planes along that axis will also re-locate relative to the new location of the edited plane to maintain their existing **Spacing** values.

Delete

Deletes the selected grid plane. You cannot delete grid planes that have already been placed in the model.

Create Radial Cylinder (Grid Wizard)



Creates new radial cylinders by defining the location of the start cylinder, the offset from that location, and the number of copies to generate. You can also modify existing radial cylinders.

Radial Cylinder Settings

NOTE You cannot use the **Grid Wizard** to modify these options after initial placement.

Reference CS

Select the coordinate system to reference for the location of the **Start Plane**. The name of the coordinate system set in the **Create Coordinate System** dialog box of the **Grid Wizard** displays by default.

Start cylinder

Specify the location of the first cylinder. The location is relative to the **East (X)** \ **X** coordinate of the coordinate system specified in the **Reference CS** box. If radial cylinders already exist, you can select one from the list. The **Start cylinder** list allows you to type the text for the cylinder name along with the location information. For example, you can do the following:

- Specify the plane position as **20.00 m**
- Type the text for plane name as **'RADCYLIN1'**
- Type the text for plane name along with the plane position as **'RADCYLIN1' + 20.00 m**

Copies

Type the number of radial cylinders copies to create.

Spacing

Type the spacing between the radial cylinders.

End cylinder

Displays the location of the last radial cylinder. You cannot edit this value.

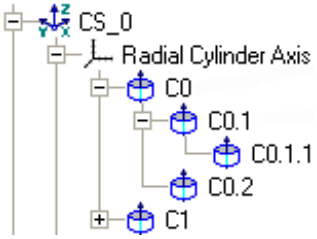
Name rule

Select the name rule to use to name the radial cylinder that you are creating. For more information about what each naming rule does, see *Grids Naming Rules* (on page 12).

Nesting level

Defines the nesting level for the radial cylinder. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent cylinders, a difference of only one level is allowed. Therefore, secondary cylinders are only allowed between two primary cylinders. Similarly,

tertiary cylinders are only allowed between two secondary cylinders.



Type

Specifies the type of radial cylinder. Examples of grids radial cylinders are: E-W Grid Plane, N-S Grid Plane, and Expansion Joint Plane. You can define new radial cylinders in the reference data.

Add

Adds the defined radial cylinders to the **Radial Cylinder Locations** list.

Radial Cylinder Locations

NOTE If you are editing an existing coordinate system, the **Radial Cylinder Locations** list displays existing cylinders in blue and new cylinders in black.

Location

Displays the location of the cylinder with respect to the parent coordinate system origin.

Type

Specifies the type of cylinder. You can change the type if necessary.

Name

Displays the name of the cylinder. You can edit the name by selecting the box and then typing a new name.

Nesting level

Displays the nesting level of the cylinder.

Global Location

Displays the location of the cylinder relative to the global coordinate system origin.

Spacing

Specifies the spacing between planes for a project to monitor the relative location of these planes. The first plane is always set to 0.00. For each subsequent plane, the **Spacing** value is its relative distance from the previous plane. This is a read-only value when creating a new coordinate system but can be modified in an existing coordinate system.

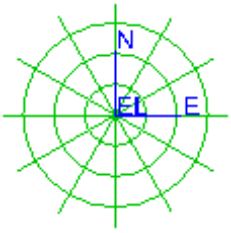
NOTE If you edit the **Spacing** value of an existing plane, the plane shifts to the new location as required. In addition, the remaining planes along that axis will also re-locate relative to the new location of the edited plane to maintain their existing **Spacing** values.

Delete

Deletes the selected cylinder. You cannot delete cylinders that have already been placed in the model.

Create Radial Planes (Grid Wizard)

Creates new radial planes around the radial cylinders. Radial planes are placed with respect to the North / Y-axis being 0-degrees. Radial planes are placed across the entire radial cylinder. Therefore, you cannot place a plane that is equal to or greater than 180-degrees (the 0-degree plane is the 180-degree plane, the 45-degree plane is the 135-degree plane, and so forth). With the **Grid Wizard**, you can also modify existing radial planes.



Radial Plane Settings

NOTE You cannot use the **Grid Wizard** to modify these options after initial placement.

Reference CS

Select the coordinate system to reference for the location of the **Start Plane**. The name of the coordinate system set in the **Create Coordinate System** dialog box of the **Grid Wizard** displays by default.

Start plane

Specify the location of the first radial plane. The location is relative to the **North (Y) \ Y** coordinate specified for the selected reference coordinate system. If radial planes already exist, you can select one from the list. The **Start plane** list allows you to type the text for plane name along with the location information. For example, you can do the following:

- Specify the plane position as **20.00 m**
- Type the text for plane name as **'RADPLANE1'**
- Type the text for plane name along with the plane position as **'RADPLANE1' + 20.00 m**

Copies

Type the number of radial plane copies to create.

Spacing

Type the spacing between the radial planes along the Y-axis.

End plane

Displays the location of the last radial plane. You cannot edit this value.

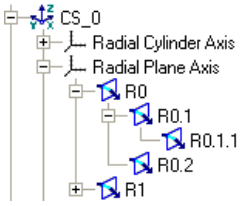
Name rule

Select the name rule to use to name the radial planes that you are creating. For more information about what each naming rule does, see *Grids Naming Rules* (on page 12).

Nesting level

Defines the nesting level for the radial plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent radial planes, a difference of only one level is allowed. Therefore, secondary radial planes are only allowed between two primary radial planes.

Similarly, tertiary radial planes are only allowed between two secondary radial planes.



Type

Specifies the type of radial plane. You can define radial plane types in the reference data.

Add

Adds the defined radial plane settings to the **Radial Plane Locations** list.

Radial Plane Locations

NOTE If you are editing an existing coordinate system, the **Radial Plane Locations** grid displays existing planes in blue and new planes in black.

Location

Displays the location of the radial plane with respect to the North \ Y axis of the parent coordinate system.

Type

Specifies the type of radial plane. You can change the radial plane type if necessary.

Name

Displays the name of the radial plane. You can edit the name by selecting the box and then typing a new name.

Nesting level

Displays the nesting level of the radial plane.

Global Location

Displays the location of the radial plane relative to the North \ Y axis of the global coordinate system.

Spacing

Specifies the spacing between planes for a project to monitor the relative location of these planes. The first plane is always set to 0.00. For each subsequent plane, the **Spacing** value is its relative distance from the previous plane. This is a read-only value when creating a new coordinate system but can be modified in an existing coordinate system.

NOTE If you edit the **Spacing** value of an existing plane, the plane shifts to the new location as required. In addition, the remaining planes along that axis will also re-locate relative to the new location of the edited plane to maintain their existing **Spacing** values.

Delete

Deletes the selected radial plane. You cannot delete radial planes that have already been placed in the model.

Associated Elevation Planes (Grid Wizard)

Specifies where grid lines or arcs appear in the model. You can place grid lines or arcs only where grid planes/cylinders intersect elevation planes. Therefore, you must place at least one elevation plane and one grid plane/cylinder before you can successfully use this dialog box.

Display grid lines on

Specifies how to choose the elevation planes that the grid planes/cylinders intersect. The selected elevation planes display a grid line or arc.

Available Elevation Planes

Displays all elevation planes that intersect the active grid plane/cylinder. Elevation planes in this list do not have a grid line/arc.

Selected Elevation Planes

Displays all elevation planes that you have selected to have a grid line/arc.

Add

Moves the selected plane from the **Available Elevation Planes** list to the **Selected Elevation Planes** list.

Remove

Deletes the selected plane from the **Selected Elevation Planes** list. When a plane is removed, it appears in the **Available Elevation Planes** list.

SECTION 4

Import and Export Coordinate Systems

You can import and export complete coordinate systems using the **Import Grids** and **Export Grids** commands. Both commands are located in the **File** menu.

See Also

Import Grids (on page 31)
Export Grids (on page 33)

Import Grids

The **File > Import > Grids** command imports a coordinate system into the model. This command recognizes XML and XLS files that have been exported from a different model.

TIPS

- You can modify the distance and angles in the exported XML or XLS in any accepted Units of Measure format and then import. It is easier to modify the inputs in XLS than in XML.
- You can use the **AvailableUnitFormats** sheet in the exported XLS file to understand the accepted Units of Measure format.
- Duplicate coordinate systems are not allowed in a model. If you try to import a coordinate system with a duplicate name, the software prompts you to change the name before importing.

Topics

Import coordinate system 31
General Tab (Import Grids Dialog Box).....32
Settings Tab (Import Grids Dialog Box).....32

Import coordinate system

1. Select **Tasks > Grids**.
2. Click **File > Import > Grids**.
3. In the **Import Grids** dialog box, browse to the import file location of the XLS or XML file that was exported from a different model.
4. Specify the **Import log file location**.
5. Select the coordinate systems to import from the list of all available systems.
6. Select a **Parent System** for the coordinate system.
7. Select a **Permission Group** for the coordinate system.
8. Click **View** to see the import file.
9. Click **Import**.

   A progress bar displays in the bottom of the dialog box.

General Tab (Import Grids Dialog Box)

The **Import Grids** dialog box allows you to select which coordinate systems to import to the current model.

Import file location

Specifies the XML or XLS file to import.

Import log file location

Specifies the import process log file location.

Select coordinate systems to be imported

Specifies the coordinate systems to import.

Select All

Selects all available coordinate systems in the list.

Clear All

Selects none of the coordinate systems in the list.

Parent System

Assigns the coordinate system to a particular parent system.

Permission Group

Specifies the permission group for the imported coordinate system.

View

Displays the file selected for import.

Import

Begins the import process.

Close

Exits the **Import Grids** dialog box.

Settings Tab (Import Grids Dialog Box)

Specifies settings for the import process.

Include Custom Attributes

Imports custom attribute settings.

Export Grids

The **File > Export > Grids** command exports the coordinate system to an XLS or XML file. The exported file contains all needed information to import the coordinate system into a different model. All the distance and angle values are exported with the **Units** and **Precision** as set in **Tools > Options... > Units of Measure** window.

Topics

Export coordinate system 33
General Tab (Export Grids Dialog Box) 33
Settings Tab (Export Grids Dialog Box) 34

Export coordinate system

1. Select **Tasks > Grids**.
2. Click **File > Export > Grids**.
3. In the **Export Grids** dialog box, select one or more coordinate systems from the list of available systems.
4. Browse to a folder to save the export file, and give the file a name that ends with an XLS or XML extension.
5. Specify a location for the export process log file.
6. Click **Export**.

   A progress bar displays at the bottom of the dialog box.
7. After the export process is complete, click **View** to see the export file.

General Tab (Export Grids Dialog Box)

Specifies which grid systems to export to a user-defined location.

Select coordinate systems to be exported

Specifies one or more coordinate systems from the list of all available systems.

Select All

Selects all coordinate systems in the list.

Clear All

Selects none of the coordinate systems in the list.

Export file location

Allows you to choose a location for the export file. You must give the file a name with either an XLS or XML extension.

Export log location

Allows you to choose a location for the export process log file.

View

Displays the file after the export process has completed.

Export

Begins the export process.

Cancel

Exits the **Export Grids** dialog box.

Settings Tab (Export Grids Dialog Box)

Specifies settings for the export process.

Include Custom Attributes

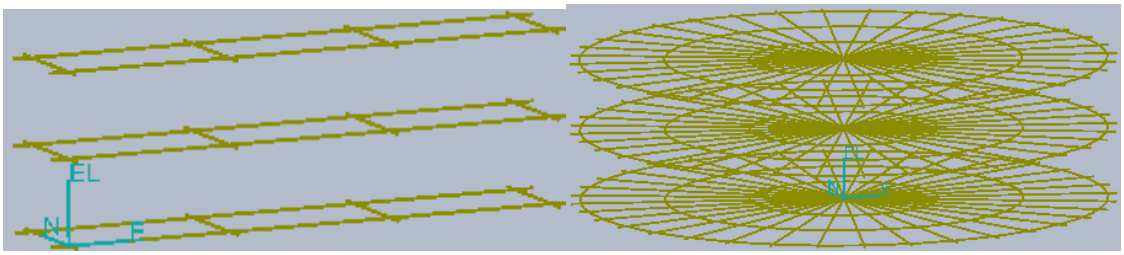
Retains custom attribute settings during the export process.

SECTION 5

Place Coordinate System

Defines a geographical reference that you can use to specify distances for input, read positions for output, and view orientation of the model. For example, your design might have a building or a pipe rack that is skewed in relation to the global coordinate system. To make modeling easier, you can create a rotated design coordinate system for that building or pipe rack.

You can place rectangular Cartesian coordinate systems or radial coordinate systems, or you can combine both radial and rectangular planes in a single coordinate system. Both coordinate system shapes are three-dimensional and define points within the space by measuring distances along the X-, Y-, and Z-axes.



There are two types of coordinate systems: the global coordinate system (always a rectangular Cartesian shape) and a design coordinate system (can be either shape).

Global Coordinate System

Each model contains one global coordinate system that you cannot see, edit, or delete. The global coordinate system origin is at (0,0,0) in the model. The positive Y-axis is set as the global north (0 degrees) or looking port. The positive Z-axis is set as positive elevation. The positive X-axis is set as global east or looking toward the bow.

Design Coordinate System

Design coordinate systems are always created in relation to the global coordinate system. Because you cannot see the global coordinate system, you may want to create your first design coordinate system at global (0,0,0) with the Y-axis bearing set to 0 so that you can visually reference the global coordinate system.

A design coordinate system is used to specify locations more conveniently when modeling. For example, it may be more convenient to route piping in a pipe rack with respect to the southwest corner of the pipe rack than to route piping with respect to the global coordinate system origin. This instance is especially the case if the pipe rack is located a great distance from the global coordinate system origin. Therefore, you would create a new design coordinate system with the origin corresponding to the southwest corner of the pipe rack. Then, using the pipe rack coordinate system as the active coordinate system, place the structural members of the pipe rack and route the piping through the rack. In another example, it may be more convenient to route piping in a compartment with respect to the corner of the compartment. Therefore, you would create a new design coordinate system with the origin corresponding to the corner of the compartment.

Another useful feature of design coordinate systems is the ability to rotate the design coordinate system north from the global coordinate system north. This rotation would further ease placement operations if the pipe rack were rotated at an odd angle with respect to the global coordinate system.

You can also use design coordinate systems to specify a model monument. Think of the model monument as the master reference point for the model. For most models, the origin corresponds to a survey benchmark or some well-known, immovable landmark at the model site from which measurements can be made.

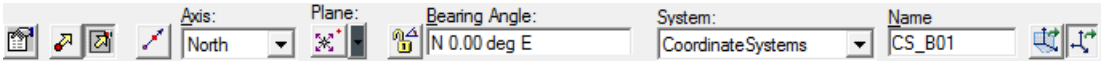
IMPORTANT Smart 3D supports the modeling of objects within a 100 km range (-50,000 meters to +50,000 meters along each axis) from the global coordinate system origin. However, due to the 32-bit precision limitations of graphic cards, objects modeled further than 10,000 meters (6.2 miles) of the global coordinate system might not display correctly when you zoom in (circular objects will appear distorted for example). If your model coordinate values are large (for example, E = 60,000, N = 55,000), to get the coordinate readout that you want, you should define a coordinate system at correspondingly large negative values (example, E = -60,000, N = -55,000). Then, use the coordinate system that you created as your active coordinate system for modeling and output. Do not bring this new coordinate system into your workspace.

Generally, you create all of your needed design coordinate systems at the beginning of a project. However, you can place design coordinate systems at any time during a project.

The software represents each design coordinate system that you place using a triad showing the X-, Y-, and Z-axes (for Ship coordinate systems) or the north (N), east (E), and elevation (EL) axes (for Grids coordinate systems). If you need to place a coordinate system that is rotated about the X- or Y-axes, use the *Place Coordinate System by Three Points* (on page 46) instead of this command.

Coordinate System Ribbon

Sets options for the design coordinate system that you are placing.



Properties

Activates the **Coordinate System Properties** dialog box. For more information, see *Coordinate System Properties Dialog Box* (on page 41).

Origin

Specifies the point from which to move the origin of the design coordinate system in relation to the global coordinate system. The software places a coordinate system triad at the origin when you have defined it. In modify mode, the system prompts you to select a *move from* point. After you select that move from point, the software prompts you to select a *move to* point. The triad follows the cursor as you select the move to point.

Move To

Specifies the new location for the coordinate system origin. This option is only available when you are modifying a coordinate system. You can turn off the **Exclude Planes** options if necessary before selecting the move to point.

Axis Direction

Defines the orientation of the axis. The system uses a point that you define and the origin of the coordinate system to define the orientation of the axis. The coordinate system triad

rotates as you are defining the axis direction.

Axis

Specifies the axis that you want to use to define the rotation of the coordinate system that you are placing. You can select the **North**, **South**, **East**, or **West** axis.

Plane

Specifies the active projection plane. This option is available only when you are modifying a coordinate system and requires that planes currently exist in the coordinate system being modified.

Lock/Unlock Bearing Angle

Turns locking on and off for the bearing angle.

Bearing Angle

Displays or sets the bearing angle for the axis. This box displays the bearing angle defined by the origin and the point that you defined in the **Axis Direction** box. Valid values are **0** to **90**.

System

Specifies the parent system for the design coordinate system that you are creating.

Name

Defines the name of the design coordinate system that you are creating.

Type

Indicates the type of coordinate system to place. Select one of the following options:

- **Grids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can only be rotated with respect to the Elevation axis (Z-axis). Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **MHGrids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can be rotated about the East, North, or Elevation axis. Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **Ship** - Uses X, Y, and Z to define the three coordinate system axes. Naming rules for the elevation (Z) and grid plane names generally use F, L, and D. Grid lines are not placed by default but can be placed if you want.

NOTE This option displays only for marine models.

Include Planes

Moves the grid planes with the coordinate system origin. For example, if a grid plane is placed 10 meters east of the coordinate system origin, that grid plane will still be 10 meters east of the origin after the origin is moved 20 meters east. This option is only available in modify mode when you are moving a coordinate system's origin.

Exclude Planes

Leaves the grid planes at their current location and re-calculates the grid planes' relative position to the new location of the coordinate system origin. For example, if a grid plane is

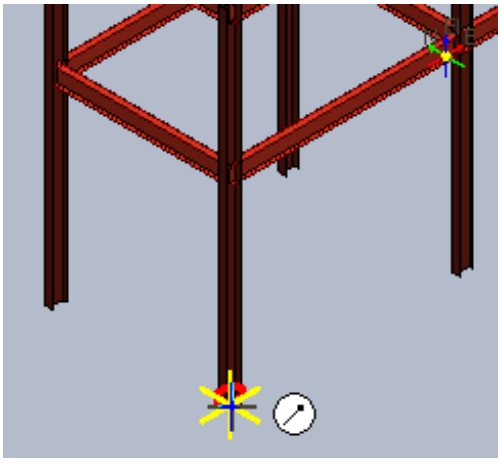
placed 10 meters east of the coordinate system origin, and that origin is moved 20 meters east, then the grid plan's location to the origin is re-calculated to be 10 meters west of the origin. This option is only available in modify mode when you are moving a coordinate system's origin.

What do you want to do?

- *Place a coordinate system* (on page 38)
- *Copy a coordinate system* (on page 39)
- *Edit coordinate system properties* (on page 39)
- *Move a coordinate system origin* (on page 40)
- *Edit a coordinate system name* (on page 41)
- *Modify coordinate system bearing* (on page 41)
- *Delete a coordinate system* (on page 41)

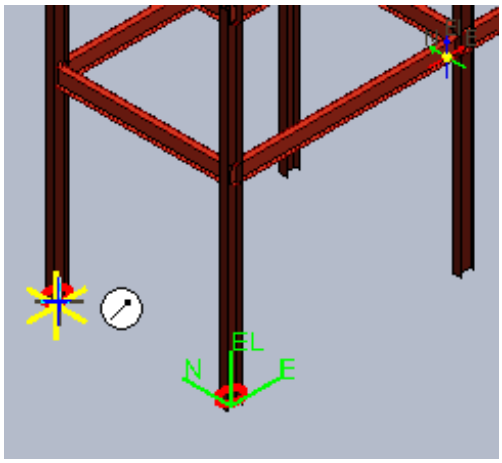
Place a coordinate system

1. Click **Place Coordinate System** on the vertical toolbar.
2. Specify the origin of the coordinate system by clicking in a graphic view.



3. Select the reference axis in the **Axis** box on the ribbon. This axis is the one that you want to define with your next click. North is the default.

4. Define the direction of the reference axis by clicking in a graphic view. You can also define the bearing of the reference axis by using the **Bearing Angle** box on the ribbon.



NOTE The software always assumes that up is vertical.

Copy a coordinate system

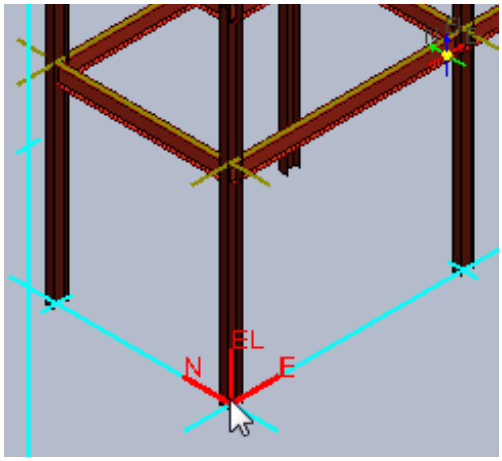
1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to copy.
4. Click **Edit > Copy**.
5. Click **Edit > Paste**.
6. In the **Selection** column, select a parent system for the newly copied coordinate system, and then click **OK** on the **Paste Special** dialog box.
7. Click **Origin** on the ribbon.
8. Identify the origin location for the copied coordinate system in a graphic view.
9. Click in the **Name** box on the ribbon, and then type a new name for the copied coordinate system.

Edit coordinate system properties

1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to edit.
4. Click **Edit > Properties**.
5. Edit the properties as needed.
6. Click **OK**.

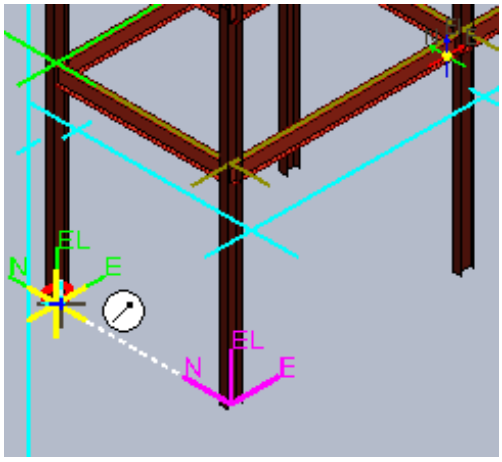
Move a coordinate system origin

1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to move.



4. Click **Move To** on the ribbon bar.
5. Select whether to include grid planes in the move or exclude them.

   TIP Choose include to move the origin and the grid planes. Choose exclude to only move the origin (the grid planes remain at their current location and their positions are recalculated relative to the new origin location).
6. Identify the new origin location in a graphic view.



Edit a coordinate system name

1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to rename.
4. Click **Edit > Properties**.
5. Select the **General** tab.
6. Type a new name in the **Name** box.
7. Click **OK**.

Modify coordinate system bearing

1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to modify.
4. If the bearing angle is locked, click **Lock/Unlock Bearing Angle** to modify the angle.
5. Type a new bearing in the **Bearing Angle** box.

Delete a coordinate system

1. Click **Select** on the vertical toolbar.
2. Select **Coordinate System** in the **Locate Filter** box.
3. Select the coordinate system to delete.
4. Click **Edit > Delete**.

NOTE All grid and elevation planes associated with the deleted coordinate system are also deleted.

Coordinate System Properties Dialog Box

Sets properties, or options, for the selected coordinate system.

See Also

General Tab (Coordinate System Properties Dialog Box) (on page 42)
Relationship Tab (on page 45)
Configuration Tab (on page 43)

General Tab (Coordinate System Properties Dialog Box)

Sets the general properties of the selected design coordinate system.

Standard

Parent System

Displays the parent system for the object.

Name

Specifies the name of the object.

Description

Specifies a description for the object.

Type

Indicates the type of coordinate system to place. Select one of the following options:

- **Grids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can only be rotated with respect to the Elevation axis (Z-axis). Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **MHGrids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can be rotated about the East, North, or Elevation axis. Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **Ship** - Uses X, Y, and Z to define the three coordinate system axes. Naming rules for the elevation (Z) and grid plane names generally use F, L, and D. Grid lines are not placed by default but can be placed if you want.

Global X

Sets the origin X-coordinate of the design coordinate system. The X-coordinate is given in relation to the Global Coordinate System.

Global Y

Sets the origin Y-coordinate of the design coordinate system. The Y-coordinate is given in relation to the Global Coordinate System.

Global Z

Sets the origin Z-coordinate of the design coordinate system. The Z-coordinate is given in relation to the Global Coordinate System.

North (Y) Axis Direction

Sets the compass bearing of the Y-axis of the coordinate system relative to the Y-axis of the Global Coordinate System.

Drawing Style

You can use the **Drawing Style** property to suppress or include user-selected grid entities in a drawing document. When you create a drawing view style in the **Drawings and Reports** task, you can specify a filter that looks for the **Drawing Style** and uses that property to specify how the grid entities are symbolized in the drawing document.

Drawing Style 1

Specifies the drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

Drawing Style 2

Specifies the second drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

See Also

Coordinate System Properties Dialog Box (on page 41)

Configuration Tab

Displays the creation, modification, and status information about an object.

NOTE You cannot define the filters using the **Configuration** tab.

Plant

Displays the name of the model. You cannot change this value.

Permission Group

Specifies the permission group to which the object belongs. You can select another permission group, if needed. Permission groups are created in Project Management.

Transfer

Reassigns ownership of the selected model objects from their current permission group to another satellite or host permission group. This option is only available if the active model or project is replicated in a workshare configuration. The option is not available if all of the objects in the select set already belong to another location and are non-transferable. For more information, see *Transfer Ownership Dialog Box* in the *Common User's Guide*.

NOTE The **Transfer** option does not apply to the filters and surface style rules.

Approval State

Specifies the current status of the selected object or filter. The display depends on your access level. You might be unable to change the status of the object. The list is defined by the ApprovalStatus codelist.

NOTE You can only edit or manipulate an object with a status of **Working**.

Status

Specifies the location of the object in the workflow process. Changing this property sets the

Approval State. The list is controlled by the ApprovalReason codelist in the ApprovalReason.xls file. You must bulkload this file. For more information, see *ApprovalReason* in the *Reference Data Guide*.

Date Created

Specifies the creation date of the object.

Created by

Specifies the name of the person who created the object.

Date Last Modified

Specifies the date when the object was last modified.

Last Modified by

Specifies the name of the person who last modified the object.

Transfer Ownership Dialog Box

Allows you to specify a new location and permission group for the selected model objects.

Current location

Displays the name of the location with which the current permission group is associated. All of the objects in the select set must belong to the same location.

Current permission group

Displays the name of the permission group with which the selected objects are currently associated. If all of the objects in the select set do not belong to the same permission group, this box appears blank.

New location

Specifies the name of the location to which you want to assign the objects. In a global workshare configuration, this box lists all the locations in which you have write access to one or more permission groups. The selection in this box filters the entries in the **New permission group** box.

New permission group

Specifies the new permission group to which to assign the selected objects. If you specify a value in the **New location** box, this list displays all permission groups to which you have write access in the selected location. If you do not specify a value in the **New location** box, this list includes all permission groups to which you have write access in all locations except the current location. This box is blank if you do not have write access to any permission groups at any locations other than the current one.

NOTE We strongly recommend that administrators follow naming convention rules that include the location as a prefix in the permission group name.

Relationship Tab

Displays all objects related to the selected object for which you are viewing properties. For example, if you are viewing the properties of a pipe run, the related pipeline, features, parts, associated control points, hangers or supports, and equipment display on this tab. All WBS assignments, including project relationships, appear on this tab.

Additional examples for marine relationships are as follows:

- For plate and profile system properties, the related bounded objects, bounding objects, and connections are shown.
- For plate and profile system part properties, parent systems are shown.
- For assembly connection properties, all connected objects are shown.
- For the properties of a frame connection on a member, supported, supporting, and auxiliary supporting parts are shown.
- For split connection properties, the parent and auxiliary supporting parts are shown.

Name

Specifies the name of the object.

Type

Specifies the type of object. To change the options on the list, edit the **Weld Type** select list in Catalog.

Go To

Displays the properties of the selected object.

SECTION 6

Place Coordinate System by Three Points

The **Place Coordinate System by Three Points** command defines a geographical reference that you can use to specify distances for input, read positions for output, and view orientation of the model. Use this command instead of the *Place Coordinate System* (on page 35) when you need to place the coordinate system rotated about the X-, Y-, or Z-axis. The need for a rotated coordinated system can occur when orienting profiles on a hull, for example.

Generally, you create all of your needed design coordinate systems at the beginning of a project. However, you can place design coordinates systems at any time during a project.

The software represents each design coordinate system that you place using a triad showing the X-, Y-, and Z-axes (Ship type coordinate systems) or the north (N), east (E), and elevation (EL) axes (Grids type coordinate systems).

Coordinate System by Three Points Ribbon

Sets options for the design coordinate system that you are placing by three points.

Properties

Opens the **Coordinate System Properties** dialog box. For more information, see *Coordinate System Properties Dialog Box* (on page 41).

Coordinate System Origin Point

Specifies the origin of the new design coordinate system in relation to the global coordinate system. This origin point is used to define the common end of the X-, Y-, and Z-axes.

Move To

Specifies the new location for the coordinate system origin. This option is only available when you are modifying a coordinate system.

First Axis Point

Specifies which axis, X-, Y-, or Z-axis, you are defining first for the coordinate system. The system uses the point that you define and the origin of the coordinate system to define the orientation of this selected axis.

Second Axis Point

Specifies which axis you are defining next for the coordinate system. The system uses the point that you define and the origin of the coordinate system to define the orientation of this second axis. The software calculates the location of the third axis using the right-hand rule.

Plane

Specifies the active projection plane. This option is available only when you are modifying a coordinate system and requires that planes currently exist in the coordinate system being

modified.

Finish

Creates the coordinate system using the points that you have defined.

System

Select the parent system for the coordinate system.

Name

Defines the name of the design coordinate system that you are creating.

Type

Indicates the type of coordinate system to place. Select one of the following options:

- **Grids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can only be rotated with respect to the Elevation axis (Z-axis). Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **MHGrids** - Uses East, North, and Elevation to define the three coordinate system axes. Coordinate system can be rotated about the East, North, or Elevation axis. Naming rules for the elevation and grid plane names generally use E, N, and EL. Grid lines are placed by default.
- **Ship** - Uses X, Y, and Z to define the three coordinate system axes. Naming rules for the elevation (Z) and grid plane names generally use F, L, and D. Grid lines are not placed by default but can be placed if you want.

NOTE This option displays only for marine models.

Include Planes

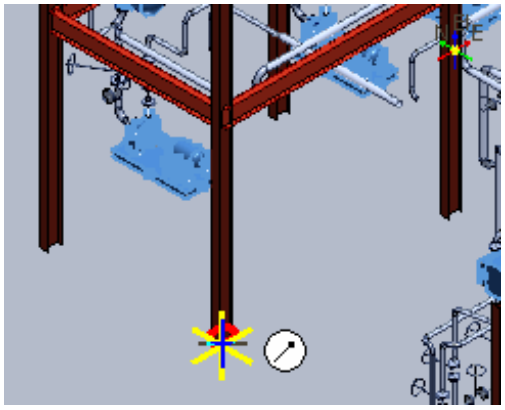
Moves the grid planes with the coordinate system origin. For example, if a grid plane is placed 10 meters east of the coordinate system origin, that grid plane will still be 10 meters east of the origin after the origin is moved 20 meters east. This option is only available in modify mode when you are moving a coordinate system's origin.

Exclude Planes

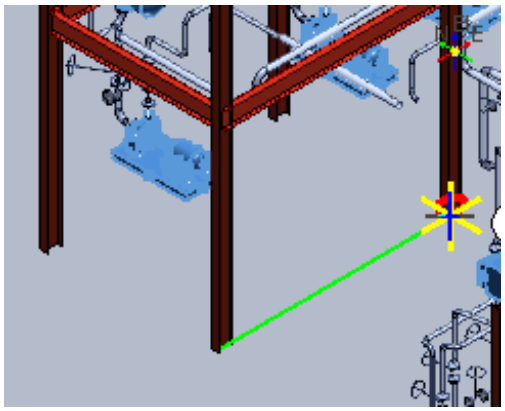
Leaves the grid planes at their current location and re-calculates the grid planes' relative position to the new location of the coordinate system origin. For example, if a grid plane is placed 10 meters east of the coordinate system origin, and that origin is moved 20 meters east, then the grid plan's location to the origin is re-calculated to be 10 meters west of the origin. This option is only available in modify mode when you are moving a coordinate system's origin.

Place a coordinate system by three points

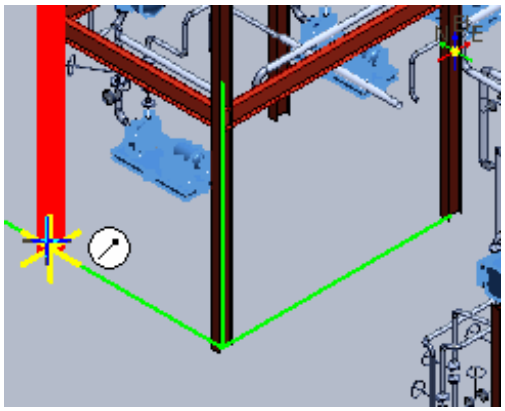
1. Click **Place Coordinate System by Three Points** .
2. Specify the origin of the coordinate system.



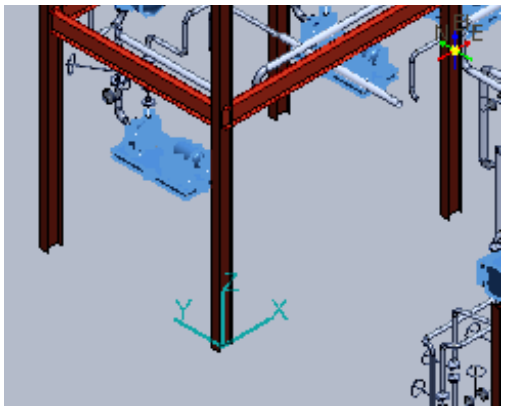
3. Select the **First Drop-down** , and click one of the coordinate system axes , , or to specify X-, Y-, or Z-axis respectively. This point and the origin point define the first axis of the coordinate system.



4. Follow the prompts to define the second axis of the coordinate system.



5. Click **Finish**.



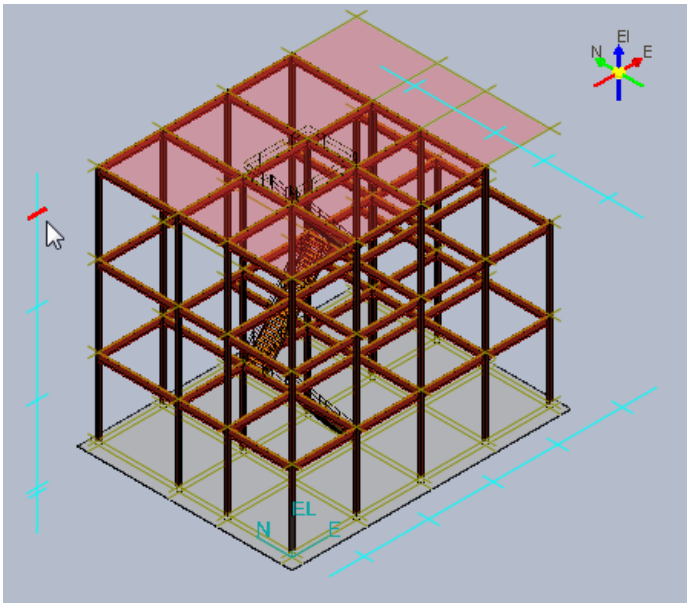
SECTION 7

Place Elevation Planes

Creates elevation planes in the coordinate system with which it is associated. Generally, you create elevation planes after you have created the coordinate system but before you have modeled anything.

Grid planes are used to define the location of grid lines in the model. Assigned to individual coordinate systems, there are two types of grid planes: elevation planes and grid planes.

Elevation planes define the elevation, or height, of the grid line with respect to the origin of the coordinate system. Elevation planes are always parallel to the X-Y plane of the coordinate system.



Place Elevation Plane Ribbon

Displays the available options when placing or editing elevation planes.

Properties

Activates the **Elevation Planes Properties** dialog box. For more information about this dialog box, see *Elevation Planes Properties Dialog Box* (on page 55).

Position

Specifies the elevation location of the elevation plane in reference to the **Up (Z)** origin coordinate of the specified design coordinate system.

CS

Identifies the design coordinate system to which the plane belongs. The origin of this coordinate system is used to define the position of the elevation plane.

Type

Specifies the type of elevation plane. The types of elevation planes are defined in the reference data.

Reference

Defines the reference plane from which the elevation plane is referenced.

Offset

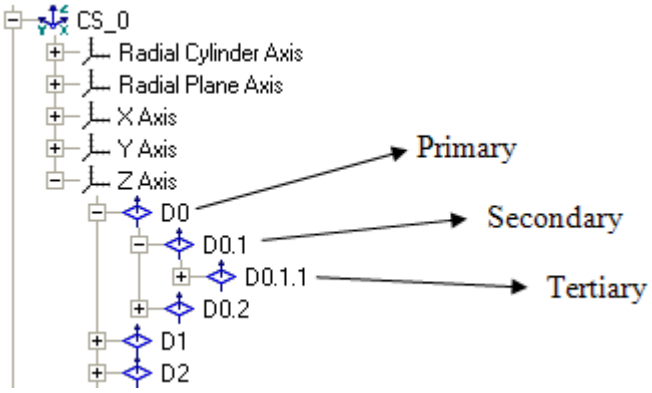
Specifies the offset between the reference plane and the elevation plane that you are creating.

Copies

Type the number of elevation planes to create using the specified **Reference** plane as the starting point and the **Offset** as the distance between the elevation planes. This option is only available when placing elevation planes.

Nesting level

Defines the nesting level for the elevation plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent planes, a difference of only one level is allowed. Therefore, secondary planes are only allowed between two primary planes. Similarly, tertiary planes are only allowed between two secondary planes.



What do you want to do?

- *Place elevation plane* (on page 52)
- *Place multiple elevation planes* (on page 52)
- *Copy elevation plane* (on page 52)
- *Edit elevation plane properties* (on page 53)
- *Change elevation plane type* (on page 53)
- *Modify elevation plane position* (on page 53)
- *Edit elevation plane name* (on page 54)
- *Delete elevation plane* (on page 54)

Place elevation plane

1. Click **Place Elevation Plane** on the vertical toolbar.
2. Select the coordinate system to associate with the elevation plane.
3. In the **Type** box, select the type of elevation plane.
4. In the **Reference** box, select the reference plane.
5. In the **Offset** box, type the offset, if any, from the reference plane at which you want to place the elevation plane.

Place multiple elevation planes

1. Click **Place Elevation Plane** on the vertical toolbar.
2. Select the coordinate system to associate with the elevation planes.
3. In the **Type** box, select the type of elevation planes.
4. In the **Reference** box, select the reference plane from which to offset the first elevation plane.
5. In the **Copies** box, type the number of copies to place.

Copy elevation plane

1. Click **Select** on the vertical toolbar.
2. Select **Elevation Plane** in the **Locate Filter** box.
3. Select the plane to copy.
4. Click **Edit > Copy**.
5. Click **Edit > Paste**.
6. In the **Selection** column of the **Paste Special** dialog box, select the coordinate system to which to copy the plane.
7. Click **OK** on the **Paste Special** dialog box.

NOTES

- The coordinate system that you are copying to cannot have an existing plane at that same relative location.
- The nesting level must be maintained. For example, if you are copying a secondary plane, you must paste it between two primary planes in the new coordinate system.

Edit elevation plane properties

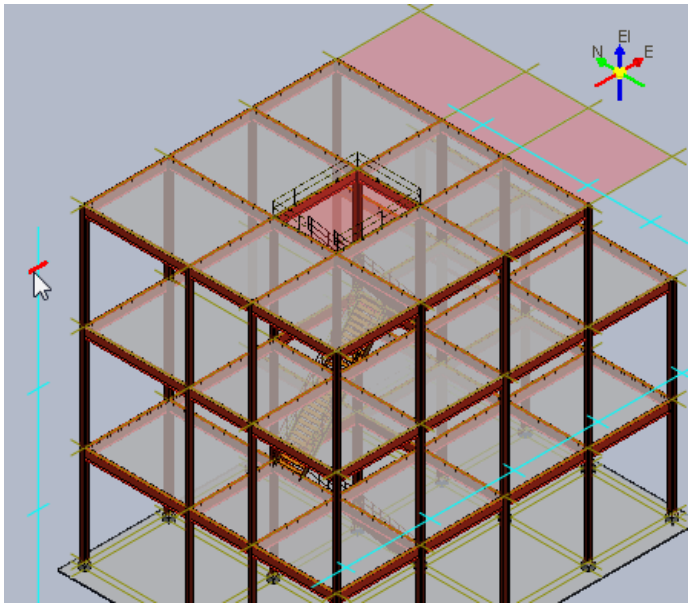
1. Click **Select** on the vertical toolbar.
2. Select **Elevation Plane** in the **Locate Filter** box.
3. Select the elevation plane to edit.
4. Click **Edit > Properties**.
5. Edit the properties as needed.
6. Click **OK**.

Change elevation plane type

1. Click **Select** on the vertical toolbar.
2. Select **Elevation Plane** in the **Locate Filter** box.
3. Select the elevation plane to edit.
4. In the **Type** box, select the new elevation plane type.

Modify elevation plane position

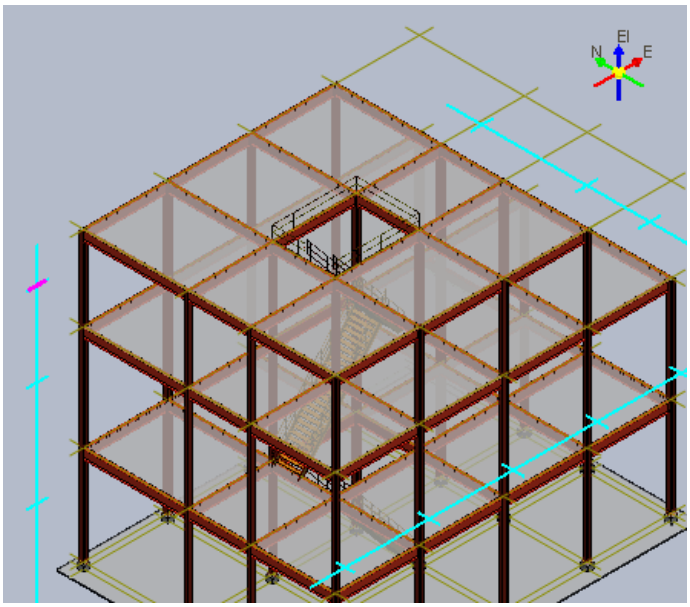
1. Click **Select** on the vertical toolbar.
2. Select **Elevation Planes** in the **Locate Filter** box.
3. Select the elevation plane to edit.



4. Click **Position** and then specify the new plane position by clicking in the graphic view.

-OR-

Type a new offset value in the **Offset** box.



Edit elevation plane name

1. Click **Select** on the vertical toolbar.
2. Select **Elevation Planes** in the **Locate Filter** box.
3. Select the elevation plane to edit.
4. In the **Name** box, type a new name for the elevation plane.

Delete elevation plane

1. Click **Select** on the vertical toolbar.
2. Select **Elevation Planes** in the **Locate Filter** box.
3. Select the elevation plane to delete.
4. Click **Delete** .

NOTE You cannot delete elevation planes that have constraints with other objects in the model.

Elevation Planes Properties Dialog Box

Sets properties, or options, for the selected elevation plane.

See Also

General Tab (Elevation Plane Properties Dialog Box) (on page 55)
Relationship Tab (on page 45)
Configuration Tab (on page 43)

General Tab (Elevation Plane Properties Dialog Box)

Sets the general properties of the selected elevation plane.

Standard

Coordinate System

Specifies the name of the coordinate system associated with the object.

Naming Rule

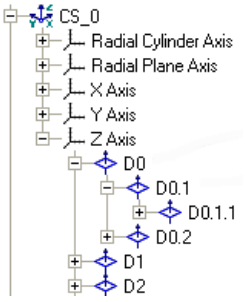
Specifies the name rule used to specify the default elevation plane name.

Name

Specifies the name of the elevation plane. Type a new name if needed.

Nesting level

Specifies the nesting level for the object plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent planes, a difference of only one level is allowed. Therefore, secondary planes are only allowed between two primary planes. Similarly, tertiary planes are only allowed between two secondary planes. The list is defined by the NestingLevelType codelist.



Type

Specifies the type of elevation plane, such as top-of- steel. The elevation plane types are defined in the reference data.

Elevation

Displays the elevation of the elevation plane with reference to the coordinate system origin.

Drawing Style

You can use the **Drawing Style** property to suppress or include user-selected grid entities in a drawing document. When you create a drawing view style in the **Drawings and Reports** task,

you can specify a filter that looks for the **Drawing Style** and uses that property to specify how the grid entities are symbolized in the drawing document.

Drawing Style 1

Specifies the drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

Drawing Style 2

Specifies the second drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

See Also

Elevation Planes Properties Dialog Box (on page 55)

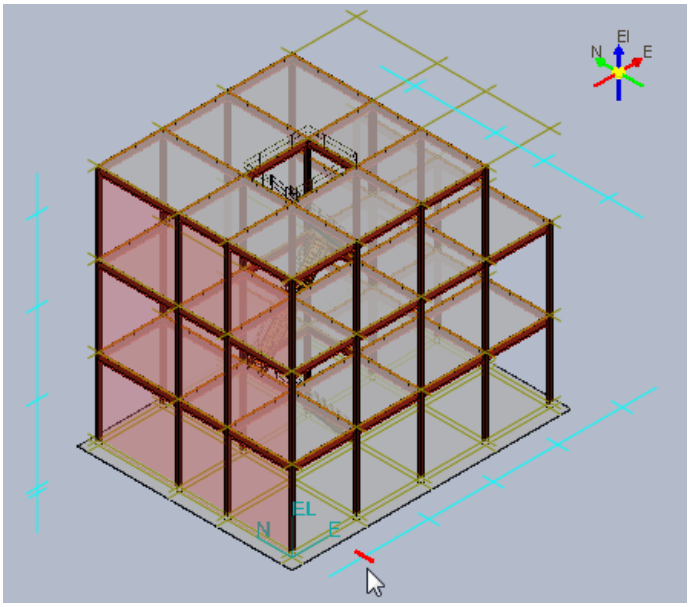
SECTION 8

Place Grid Planes

Creates grid planes that are perpendicular to the X- or Y-axes in the associated coordinate system. Generally, you create your coordinate system, then create the elevation planes, and then create the grid planes. The intersection of the grid plane and the elevation plane create grid lines.

NOTE Place more than one grid plane on the axis. If the grid lines are not bounded by two planes, the software creates them 100 m long, with a 1 m extension on each end.

In rectangular coordinate systems, grid planes define the grid line location with respect to the X- or Y-axis of the coordinate system. Grid planes are generally parallel to the X-Z or Y-Z plane of the coordinate system, but can be rotated (sloped) after placement. The grid line is defined by the intersection of the grid plane with the elevation plane. Optionally, you can place grid lines at all or some intersections. In general, use this command with rectangular coordinate systems.



For example, you created a design coordinate system for a pipe rack that you want to model. Using the **Place Elevation Plane** command, you create an elevation plane for each level in the pipe rack, including the ground level. Then you use this command to create the grid planes for each column row.

In radial coordinate systems, grid planes define the grid line location with respect to the north axis of the coordinate system. The grid planes are rotated about the coordinate system origin. The grid line is defined by the intersection of the grid plane with the elevation plane. You optionally can place grid lines at all or some intersections. In general, use the *Place Radial Grids* (on page 68) with radial coordinate systems.

Place Grid Plane Ribbon

Displays the available grid plane options when placing or editing a grid plane.

Properties

Activates the **Grid Plane Properties** dialog box. For more information, see *Grid Plane Properties Dialog Box* (on page 65).

Elevation Plane Position

Activates the **Associated Elevation Planes** dialog box. Use this dialog box to specify the elevation planes that the grid plane intersects where you want the software to generate grid lines. For more information, see Associated Elevation Planes Dialog Box.

Grid Plane Position

Specifies the intercept point of the grid plane to the axis.

CS

Specifies the coordinate system to which the grid plane belongs.

Axis

Identifies the coordinate system axis used to define the grid plane. The **Axis** value must be **X** or **Y**.

Type

Specifies the type of grid plane. You can define grid plane types in the reference data.

Reference

Defines the reference plane from which the grid plane is referenced.

Offset

Specifies the offset between the reference plane and the grid plane that you are creating.

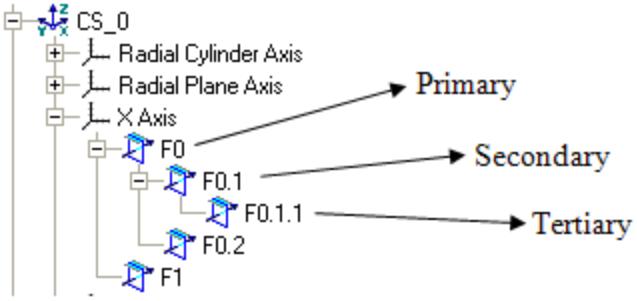
Copies

Specifies the number of grid planes to create using the specified **Reference** plane as the starting point and the **Offset** as the distance between the grid planes.

Nesting Level

Defines the nesting level for the grid plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent grid planes, a difference of only one level is allowed. Therefore, secondary grid planes are only allowed between two primary grid planes.

Similarly, tertiary grid planes are only allowed between two secondary grid planes.



Associated Elevation Planes Dialog Box

The **Associated Elevation Planes** dialog box specifies where grid lines appear in the model. You can place grid lines only where grid planes intersect elevation planes. Therefore, you must place at least one elevation plane and one grid plane before you can successfully use this dialog box.

Grid lines displayed on

Specifies how you want to choose the elevation planes that the grid planes intersect. The selected elevation planes will display a grid line.

If you select **All Planes**, all elevation planes that the grid plane intersects will display a grid line. In addition, if you add another elevation plane that intersects the grid plane, that elevation plane will automatically display a grid line without having to select that elevation plane in this dialog box.

If you select **Selected Elevation Planes**, only the elevation planes that you specify in the **Selected Elevation Planes** list will display a grid line.

Available Elevation Planes

Displays all elevation planes that intersect the active grid plane. Elevation planes in this list will not have a grid line.

Selected Elevation Planes

Displays all elevation planes that you have selected to have a grid line.

Add

Moves the selected plane from the **Available Elevation Planes** list to the **Selected Elevation Planes** list.

Remove

Deletes the selected plane from the **Selected Elevation Planes** list. When a plane is removed, it appears in the **Available Elevation Planes** list.

What do you want to do?

- *Place a grid plane* (on page 60)
- *Place multiple grid planes* (on page 60)
- *Copy a grid plane* (on page 60)
- *Rotate a grid plane* (on page 61)

- *Modify the grid plane position* (see "*Modify grid plane position*" on page 62)
- *Edit grid plane properties* (on page 63)
- *Edit grid plane name* (on page 63)
- *Edit grid plane nesting level* (on page 63)
- *Change grid plane type* (on page 64)
- *Delete a grid plane* (on page 64)
- *Delete a grid line* (on page 64)
- *Regenerate grid lines* (on page 64)

Place a grid plane

1. Click **Place Grid Plane** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the grid plane belongs.
3. In the **Axis** box, select the coordinate system axis along which to place the grid plane.
4. In the **Type** box, select the type of grid plane to place.
5. Specify the location of the grid plane by clicking in a graphic view.
6. In the **Nesting Level** box, select the nesting level of the grid planes.

NOTE We recommend that you place at least two grid planes on an axis. Grid lines that are not bounded by two grid planes are created 100 m long.

Place multiple grid planes

1. Click **Place Grid Plane** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the grid planes belong.
3. In the **Axis** box, select the coordinate system axis along which to place the grid planes.
4. In the **Type** box, select the type of grid planes to place.
5. In the **Copies** box, type the number of copies to place.
6. In the **Offset** box, type the offset between the grid planes.
7. Specify the location of the grid planes by clicking in a graphic view.
8. Select the nesting level of the grid planes.

Copy a grid plane

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to copy.

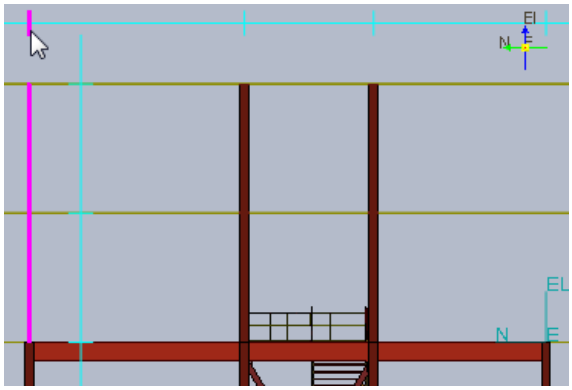
4. Click **Edit > Copy**.
5. Click **Edit > Paste**.
6. In the **Paste Special** dialog box, select the coordinate system to which to copy the grid plane.
7. Click **OK** on the **Paste Special** dialog box.

NOTES

- The coordinate system that you are copying to cannot have an existing grid plane at that same relative location.
- The nesting level must be maintained. For example, if you are copying a secondary grid plane, you must paste it between two primary grid planes in the new coordinate system.

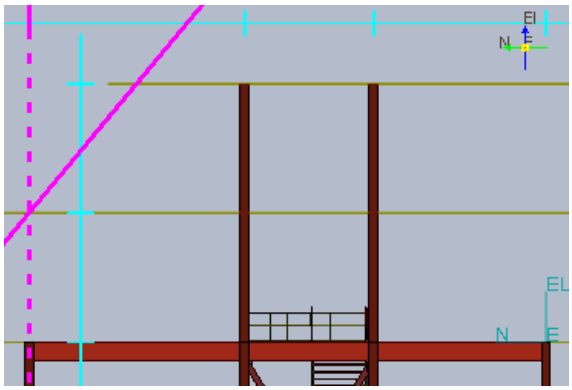
Rotate a grid plane

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to rotate.



4. Click **Edit > Properties**.
5. Select the **General Tab**.
6. Select the **Axis of Rotation** to use.
7. Select the **Rotation Offset Type** you want to use. For more information about the types, see *General Tab (Grid Plane Properties Dialog Box)* (on page 65).
8. Optionally, define an offset distance.

9. Define the angle of rotation using either the **Angle of Rotation** box or the **Slope (1/X)** box.

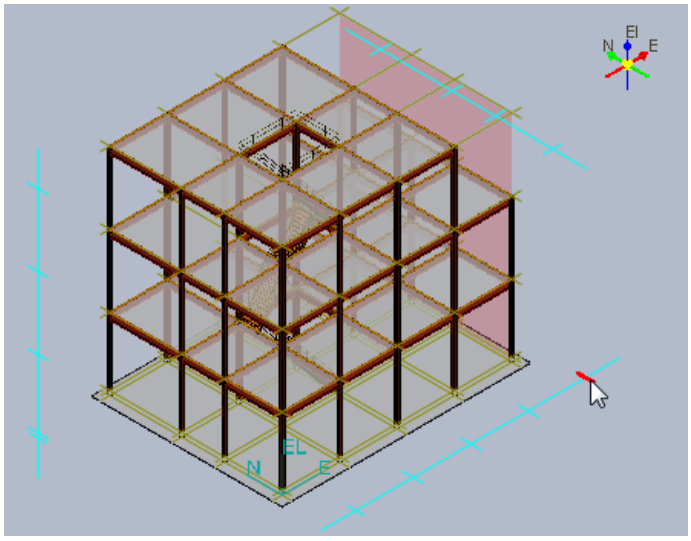


10. Click **Apply**.

Modify grid plane position

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to move.

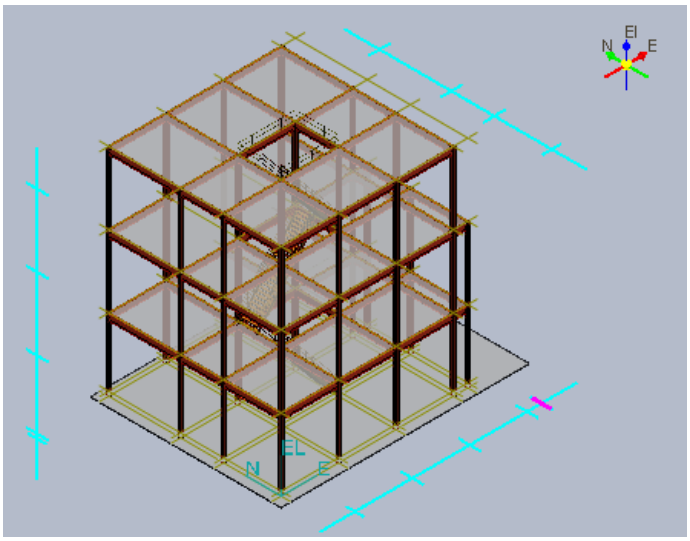
   NOTE You must select a continuous set of grid planes of the same nesting level to modify. That is, you cannot select the west-most grid plane and the east-most grid plane to modify without selecting all intermediate planes.



4. Click **Grid Plane Position** and then specify the new plane position by clicking in the graphic view.

   -OR-

Type a new offset value in the **Offset** box.



Edit grid plane properties

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to edit.
4. Click **Edit > Properties**.
5. Edit the properties as needed.
6. Click **OK**.

Edit grid plane name

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to edit.
4. In the **Name** box on the ribbon, type a new name for the grid plane.

Edit grid plane nesting level

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to edit.
4. In the **Nesting Level** box, select a new nesting level.

NOTE Between two adjacent grid planes, a difference of only one level is allowed. Therefore, secondary grid planes are only allowed between two primary grid planes. Similarly, tertiary grid planes are only allowed between two secondary grid planes.

Change grid plane type

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to edit.
4. Select a new type from the **Type** list.

NOTE You can define the grid plane types in the reference data.

Delete a grid plane

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane to delete.
4. Click **Delete**.

Delete a grid line

1. Click **Select** on the vertical toolbar.
2. Select **Grid Line** in the **Locate Filter** box.
3. Select the grid line to delete.
4. Click **Delete**.

NOTE When you delete the grid line, the software also deletes all relationships to that grid line.

Regenerate grid lines

1. Click **Select** on the vertical toolbar.
2. Select **Grid Plane** in the **Locate Filter** box.
3. Select the grid plane that contains the grid lines to regenerate.
4. Click **Elevation Plane Position** on the ribbon.
5. Use the dialog box to specify the elevation planes that the grid plane intersects where you want the software to generate grid lines. For more information, see Associated <ElevationZ> Planes Dialog Box.

Grid Plane Properties Dialog Box

Sets properties, or options, for the selected grid plane.

See Also

General Tab (Grid Plane Properties Dialog Box) (on page 65)
Relationship Tab (on page 45)
Configuration Tab (on page 43)

General Tab (Grid Plane Properties Dialog Box)

Sets the general properties of the selected grid plane.

Standard

Coordinate System

Specifies the name of the coordinate system associated with the object.

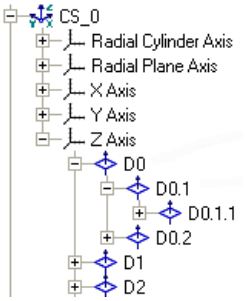
Naming Rule

Displays the available name rules for the selected object. Specify the naming rule to use to name the object. You can select one of the listed rules, or you can select **User Defined** to specify the name yourself in the **(Name)** box. **Name**

Specifies the name of the object. Names generated by a rule include a Global Workshare name rule ID if the name rule ID was defined when the model database was created. For more information, see *Using Global Workshare* in the *Global Workshare Guide*.

Nesting Level

Specifies the nesting level for the object plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent planes, a difference of only one level is allowed. Therefore, secondary planes are only allowed between two primary planes. Similarly, tertiary planes are only allowed between two secondary planes. The list is defined by the NestingLevelType codelist.



Axis of Placement

Identifies the coordinate system axis used to define the grid plane. The value must be **X** or **Y**. The list is defined by the AxisType codelist.

Axis of Rotation

Specifies the coordinate system axis about which the grid plane rotates to give a skewed orientation. This value cannot be the axis that you specified in the **Axis** box. For example, if the **Axis** is the X-axis, then the **Rotation Axis** must be the Y- or Z-axis. This option is useful

when you want to model something with sloped sides, such as an offshore jacket. The list is defined by the AxisType codelist.

Rotation Total Offset Distance

Displays the axis of rotation location relative to the base elevation plane.

Rotation Offset Type

Select the offset type to use:

No Offset - Select this option to rotate the grid plane about the base elevation plane.

By Reference - Select this option to specify an elevation plane to use as the rotation axis. You select the elevation plane using the **Rotation Plane** box.

By Distance - Select this option to specify the axis of rotation location relative to the base elevation plane. Type the distance in the **Rotation Offset Distance** box.

By Reference-Distance - Select this option to specify an elevation plane and an offset from that plane to use as the rotation axis. You select the elevation plane using the **Rotation Plane** box and define the offset distance using the **Rotation Offset Distance** box.

Rotation Plane

Displays a list of all the elevation planes in the parent coordinate system. This option is available when **Rotation Offset Type** is set to **By Reference** or **By Reference-Distance**.

Rotation Offset Distance

Specifies the axis of rotation offset relative to the base elevation plane if **Rotation Offset Type** is set to **By Distance**, or relative to the selected elevation plane if **Rotation Offset Type** is set to **By Reference-Distance**.

Angle of Rotation

Specifies the angle of the plane about the **Axis of Rotation** using the right-hand rule. A rectangular grid plane is perpendicular to the **Axis of Rotation**.

Slope (1/X)

Enter the slope of the grid plane about the **Axis of Rotation**.

Type

Specifies the type of grid plane. Examples of grid plane types include interior wall, building edge, and girt line. You can define grid plane types in Catalog.

Position

Specifies the intersection point of the object to the axis.

Start Extension

Specifies the distance that the grid line for this plane extends beyond the intersecting start grid-plane. Extend grid lines when you are working in congested or confined model areas to select the grid plane more easily.

End Extension

Specifies the distance that the grid line for this plane extends beyond the intersecting end grid-plane. Extend grid lines when you are working in congested or confined model areas to select the grid plane more easily

Drawing Style

You can use the **Drawing Style** property to suppress or include user-selected grid entities in a drawing document. When you create a drawing view style in the **Drawings and Reports** task, you can specify a filter that looks for the **Drawing Style** and uses that property to specify how the grid entities are symbolized in the drawing document.

Drawing Style 1

Specifies the drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

Drawing Style 2

Specifies the second drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

See Also

Grid Plane Properties Dialog Box (on page 65)
Radial Grid Properties Dialog Box (on page 72)

Grid Line Properties Dialog Box

Sets properties, or options, for the selected grid line.

See Also

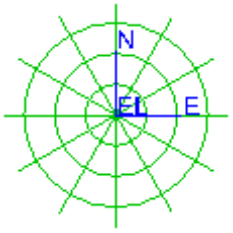
Configuration Tab (on page 43)
Relationship Tab (on page 45)

SECTION 9

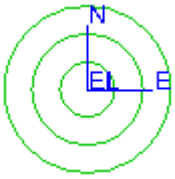
Place Radial Grids

Creates radial planes and cylinders in the associated coordinate system. Generally, you create your design coordinate system, then create the elevation planes, and then create the cylinders and radial planes. The intersection of the radial planes and the elevation plane create grid lines. The intersection of the cylinders and the elevation plane create grid arcs. There are four grid arcs, one of each quadrant of the coordinate system. You control which intersections create grid lines/arcs and which intersections do not.

Radial planes are placed with respect to the North \ Y-axis being 0-degrees. Radial planes are placed across the entire radial cylinder. Therefore, you cannot place a plane that is equal to or greater than 180-degrees (the 0-degree plane is the 180-degree plane, the 45-degree plane is the 135-degree plane, and so forth).



Cylinders are placed by defining the location of the start cylinder with regard to a reference location, the offset from that location, and the number of copies to generate. The spacing between the cylinder copies is equal to the defined offset.



In rectangular coordinate systems, grid planes define the grid line location with respect to the X- or Y-axis of the coordinate system. Grid planes are generally parallel to the X-Z or Y-Z plane of the coordinate system but can be placed rotated (sloped) about the placement axis, which is the X- or Y-axis. The grid line is defined by the intersection of the grid plane with the elevation plane. You optionally can place grid lines at all or some intersections. In general, use the *Place Grid Planes* (on page 57) with rectangular coordinate systems.

Place Radial Grid Ribbon

Displays the available radial plane options when placing or editing a radial grid plane or cylinder.

Properties

Activates the **Radial Grid Properties** dialog box. For more information, see *Radial Grid Properties Dialog Box* (on page 72).

Elevation Plane Position

Activates the **Associated Elevation Planes** dialog box. Use this dialog box to specify the

elevation planes that the cylinder or radial plane intersects where you want the software to generate grid lines or grid arcs. For more information, see Associated Elevation Planes Dialog Box.

Radial Grid Position

Specifies the intercept point of the cylinder or radial grid plane to the axis. This option is currently not available.

CS

Specifies the coordinate system to which the cylinder or radial plane belongs.

Axis

Select **C** to place a cylinder. Select **R** to place a radial plane.

Type

Specifies the type of cylinder or radial grid plane. You can define radial grid plane types in the reference data.

Reference

Defines the reference point from which to place the cylinder or radial grid plane. If you are placing a cylinder, you can select the coordinate system origin or another existing cylinder. If you are placing a radial grid plane, you can select another existing plane or the north axis origin.

Offset

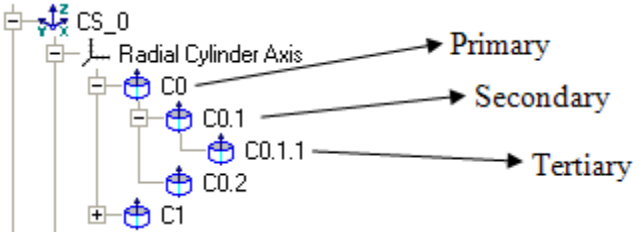
Specifies the offset between the reference object and the cylinder or radial grid plane that you are creating. Specify the offset in linear units if you are placing a cylinder. Specify the offset in degrees if you are placing a radial grid plane.

Copies

Specifies the number of cylinders or radial grid planes to create using the specified **Reference** object as the starting point and the **Offset** as the distance between the cylinders or radial grid planes.

Nesting Level

Defines the nesting level for the cylinders or radial grid planes. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent cylinders or radial grid planes, a difference of only one level is allowed. For example, secondary radial grid planes are only allowed between two primary radial grid planes. Similarly, tertiary radial grid planes are only allowed between two secondary radial grid planes.



What do you want to do?

- *Place a radial plane* (on page 70)

- *Place multiple radial planes* (on page 70)
- *Copy a radial plane* (on page 71)
- *Place a radial cylinder* (on page 71)
- *Place multiple radial cylinders* (on page 71)
- *Copy a radial cylinder* (on page 72)

Place a radial plane

1. Click **Place Radial Grid** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the radial grid plane belongs.
3. In the **Axis** box, select **R** to indicate that you are placing a radial plane.
4. In the **Reference** box, select a reference object.
5. In the **Offset** box, key in the offset, in degrees, from the reference object. The offset must be less than 180-degrees.

NOTE Radial planes are placed across the entire radial cylinder. Therefore, you cannot place a plane that is equal to or greater than 180-degrees (the 0-degree plane is the 180-degree plane, the 45-degree plane is the 135-degree plane, and so forth).

Place multiple radial planes

1. Click **Place Radial Grid** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the radial grid planes belong.
3. In the **Axis** box, select **R** to indicate that you are placing radial planes.
4. In the **Reference** box, select the reference object from which to place the first plane.
5. In the **Copies** box, type the number of copies to place.
6. In the **Offset** box, type the offset, in degrees, between the grid planes.

NOTE Radial planes are placed across the entire radial cylinder. Therefore, you cannot place a plane that is equal to or greater than 180-degrees (the 0-degree plane is the 180-degree plane, the 45-degree plane is the 135-degree plane, and so forth). Be careful when you specify the offset and number of copies values that you do not define a plane past the 180-degree point.

Copy a radial plane

1. Click **Select** on the vertical toolbar.
2. Select **Radial Plane** in the **Locate Filter** box.
3. In the **Workspace Explorer**, select the radial plane to copy.
4. Click **Edit > Copy**.
5. Click **Edit > Paste**.
6. In the **Paste Special** dialog box, select the coordinate system to which to copy the radial plane.
7. Click **OK** on the **Paste Special** dialog box.

NOTES

- The coordinate system that you are copying to cannot have an existing radial plane at that same relative location.
- The nesting level must be maintained. For example, if you are copying a secondary radial plane, you must paste it between two primary radial planes in the new coordinate system.

Place a radial cylinder

1. Click **Place Radial Grid** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the cylinder belongs.
3. In the **Axis** box, select **C** to indicate that you are placing a cylinder.
4. In the **Reference** box, select a reference object.
5. In the **Offset** box, key in the offset, in linear units, from the reference object at which to place the cylinder.

Place multiple radial cylinders

1. Click **Place Radial Grid** on the vertical toolbar.
2. In the **CS** box, select the coordinate system to which the cylinder belongs.
3. In the **Axis** box, select **C** to indicate that you are placing a cylinder.
4. In the **Reference** box, select a reference object from which to place the first cylinder.
5. In the **Copies** box, key in the number of copies to make.
6. In the **Offset** box, key in the offset, in linear units, from the reference object at which to place the first cylinder.

Copy a radial cylinder

1. Click **Select** on the vertical toolbar.
2. Select **Radial Cylinder** in the **Locate Filter** box.
3. In the **Workspace Explorer**, select the cylinder to copy.
4. Click **Edit > Copy**.
5. Click **Edit > Paste**.
6. In the **Paste Special** dialog box, select the coordinate system to which to copy the cylinder.
7. Click **OK** on the **Paste Special** dialog box.

NOTES

- The coordinate system that you are copying to cannot have an existing cylinder at that same relative location.
- The nesting level must be maintained. For example, if you are copying a secondary cylinder, you must paste it between two primary cylinders in the new coordinate system.

Radial Grid Properties Dialog Box

Sets properties, or options, for the selected grid plane.

See Also

General Tab (Radial Grid Properties Dialog Box) (on page 72)
Relationship Tab (on page 45)
Configuration Tab (on page 43)

General Tab (Radial Grid Properties Dialog Box)

Sets the general properties of the selected grid plane.

Standard

Coordinate System

Specifies the name of the coordinate system associated with the object.

Naming Rule

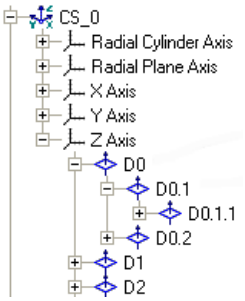
Displays the available name rules for the selected object. Specify the naming rule to use to name the object. You can select one of the listed rules, or you can select **User Defined** to specify the name yourself in the **(Name)** box. **Name**

Specifies the name of the object. If a **Name Rule** is specified, then the software uses that rule to determine this name. If the **Name Rule** value is **User Defined**, then you must type a name in this box.

Nesting Level

Specifies the nesting level for the object plane. You can select **Primary**, **Secondary**, or **Tertiary**. Between two adjacent planes, a difference of only one level is allowed. Therefore, secondary planes are only allowed between two primary planes. Similarly, tertiary planes are only allowed between two secondary planes. The list is defined by the NestingLevelType

codelist.



Axis of Placement

Identifies the object as a radial grid plane **R** or a cylinder **C**.

Type

Specifies the type of grid plane. Examples of grid plane types include interior wall, building edge, and girt line. You can define grid plane types in Catalog.

Offset

Specifies the offset from the reference object.

Start Extension

Specifies the distance that the grid line for this plane extends beyond the intersecting start grid-plane. Extend grid lines when you are working in congested or confined model areas to select the grid plane more easily.

End Extension

Specifies the distance that the grid line for this plane extends beyond the intersecting end grid-plane. Extend grid lines when you are working in congested or confined model areas to select the grid plane more easily

Drawing Style

You can use the **Drawing Style** property to suppress or include user-selected grid entities in a drawing document. When you create a drawing view style in the **Drawings and Reports** task, you can specify a filter that looks for the **Drawing Style** and uses that property to specify how the grid entities are symbolized in the drawing document.

Drawing Style 1

Specifies the drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

Drawing Style 2

Specifies the second drawing style in which grid entities display in your drawings.

TIP You can add your own custom drawing styles by adding them to the *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsDrawingStyleIntf.xls. You must also add the property values to the codelist defined in *[Product Folder]*\CatalogData\Bulkload\DataFiles\GridsCodelist.xls. The modified workbooks must to be bulkloaded for the changes to display.

NOTE Drawing styles for grid entities are not available for hanger drawings.

See Also

Grid Plane Properties Dialog Box (on page 65)
Radial Grid Properties Dialog Box (on page 72)

Glossary

approval state

Recorded state of acceptance of information contained in objects within the database. The approval states indicate a level of confidence in the information stored in the database and govern your ability to alter specific data about a product.

attribute

A single type of non-graphics information that is stored about an object such as diameter or end preparation.

axis

An imaginary line used to define the orientation of a system or object normally defined in terms of an x-, y-, and z-axis. Some 3-D graphic objects have an associated axis used to define the center or axis for rotations.

bulkload

The process by which reference data in Microsoft Excel workbooks is loaded into the Catalog database.

catalog

Repository of information about components and materials used in construction. When you use catalog parts in the model, the software places an occurrence of the catalog part in the project. This occurrence is a copy of the actual catalog part.

Catalog database

The database that contains the reference data. Each model database can reference a different Catalog database.

change history

Process of recording information such as who, when, and why for any given modification.

change management

Software features or manual procedures for managing the consequence of change. For example, software can support a change management feature to report drawings that need updating as a result of a change in a 3-D model.

change propagation

Ability of the software to intelligently modify dependent design information to reflect change in a higher order object.

codelist

A set of acceptable values for a particular property that can be referred to by an index number or selected in a combo box. For example, the codelist for the material specification allows you to select from a set of standard entries, such as ASTM A183-F316 Stainless Steel.

concurrent access

Ability of the software to allow multiple users to simultaneously access and modify the design of a model.

constraints

A logical restriction that controls how part symbols ports relate to each other and to reference ports. There are four constraints: parallel, perpendicular, coincident, and distance.

coordinate

The location of a point along the X-, Y-, or Z-axis.

coordinate system

A geometric relation used to denote the location of points in the model. The most common coordinate system is the rectangular coordinate system, whereby points are located by traversing the X-, Y-, and Z-axes of the model. Normally, coordinate systems have their origin defined as 0,0,0.

cutting plane

A plane that cuts through an object.

degree

The highest polynomial factor in the curve or surface mathematical definition. A line is a degree 1 curve, while a cubic B-spline is a degree 3 curve.

easting

A term that describes an east coordinate location in a coordinate system.

elevation (grids)

The height, or value along the Z-axis of the coordinate system, of a point.

focus of rotation

A point or line about which an object or view turns.

grid

A network of uniformly spaced horizontal and perpendicular lines that help to identify either 2-D or 3-D relationships.

grid set

A group of grid lines placed within a plane that are linked. A grid set can be manipulated as a single unit.

GUIDs

Acronym that stands for Globally Unique Identifiers. The software automatically creates the GUIDs sheet in the Excel workbooks when you create the Catalog database and schema. The purpose of storing GUIDs within Excel workbooks is to help you keep track of what has been loaded into the database. Storing GUIDs also helps to avoid the situation in which a replacement Catalog database causes existing models to become invalid.

interference checking

A process that identifies possible collisions or insufficient clearance between objects in the model.

location

A Location is defined by three user-defined inputs: 1) a unique name, 2) a unique name rule ID, and 3) the server where the Site databases reside for that Location. A Location is defined and created when the Site database is created using the Database Wizard. Additional Locations can be created in the Project Management task. Each Location is a Site-level object, thus other Plants within the same Site collection can use the Locations when the Plants are configured for Workshare.

move from point

Starting point for an action. For example, when you move an equipment object, the Move From point determines the point of origin for the move.

move to point

Ending point for an action. For example, when you move an equipment object, the Move To point determines where you want the move to stop.

node

- One of the set of discrete points in a flow graph.
- A terminal of any branch of a network or a terminal common to two or more branches of a network.
- An end point of any branch or a network or graph, or a junction common to two or more branches.

northing

A term that describes a north coordinate location in a coordinate system.

occurrence (of part or equipment)

Instantiation of a part of equipment in the model that refers to the part library; an instance of a specific object. The design can be built several times, and therefore the occurrence can apply to more than one hull. Typically, an occurrence points back to a specific object, either for its complete definition, as in the case of a particular valve, or for its made from material, as in the case of a steel plate part cut from sheets. Thus, when a designer selects a component from the catalog and places it at a location in the space of the plant, the software creates an occurrence of that object in the plant design.

occurrence property

A characteristic that applies to an individual object in the model. Occurrence properties are designated with 'oa:' in the reference data workbooks. You can view and modify occurrence properties on the Occurrence tab of the properties dialog boxes in the software. Depending on the object, some occurrence properties are read-only.

origin

In coordinate geometry, the point where the X-, Y-, and Z-axes intersect.

origin point

The point at which the coordinate system is placed, providing a full Cartesian coordinate system with positive and negative quadrants. Points are placed at coordinates relative to the origin point, represented by the X, Y, and Z values.

orthogonal

The characteristic of an element consisting completely of elements positioned at 90-degree angles. A square is an orthogonal element.

orthographic

A depiction of an object created by projecting its features onto a plane along lines perpendicular to the plane.

PDS (Plant Design System)

A comprehensive, intelligent, computer-aided design and engineering application for the process, power, and marine industries. PDS consists of integrated 2-D and 3-D modules that correspond to engineering tasks in the design workflow.

PinPoint

Tool that allows you to place, move, and modify elements with precision, relative to a reference point.

product structure

Hierarchical breakdown or decomposition of a product into constituent parts, volumes, or units. (For example, a bill of material is one possible type of product structure.)

query select sets

Set of objects that are selected in a query or queries on the database.

reference data

The data that is necessary to design plants or ships using the software. Reference data includes graphical information, such as symbols. It also contains tabular information, such as physical dimensions and piping specifications.

user attributes

A customized property in the reference data. The Custom Interfaces sheets in the Excel workbooks define these properties. You can list the customized properties on the individual part class sheets.

version control

Ability of the system to manage multiple versions of a single part of the design. Version control should support conditional analysis and promotion status, as well as alternate design features among hulls within a plant site.

vertex

A topological object that represents a point in the three-dimensional model.

viewset

Set of objects (usually a subset of the entire database) that a view operation uses. Membership or lack of membership for any object in a viewset does not affect the actual stored representation of the object, but only its availability or desirability for viewing in the current scenario.

wizard

Software routine attached to an application that provides guidance and expert help to you to complete one of the functionalities of the application.

work content

Estimation development of metrics from the database that relates to the work hour content of the various construction units.

working plane

The available 2-D plane of movement for endpoint selection.

workset

Set of objects (usually a subset of the entire database) used in an interactive change, add, or delete operation. Membership or lack of membership for any object in a workset does not necessarily affect the actual stored representation of an object. However, you can change or delete an object in a workset that also results in a change or deletion of the stored object. Similarly, when you add a new object (not currently stored) to a workset, the software also adds the object container.

workspace

Area that represents the portion of the model data needed to perform the intended task and includes the user modeling settings.

Index

A

approval state • 75
Associated Elevation Planes (Grid Wizard) • 30
attribute • 75
axis • 75

B

bulkload • 75

C

catalog • 75
Catalog database • 75
Change elevation plane type • 53
Change grid plane type • 64
change history • 75
change management • 75
change propagation • 75
codelist • 75
concurrent access • 76
Configuration Tab • 43
constraints • 76
coordinate • 76
coordinate system • 76
Coordinate System Properties Dialog Box • 41
Copy a coordinate system • 39
Copy a grid plane • 61
Copy a radial cylinder • 72
Copy a radial plane • 71
Copy elevation plane • 52
Create Coordinate System (Grid Wizard) • 18
Create Elevation Planes (Grid Wizard) • 20
Create Grid X-Planes (Grid Wizard) • 22
Create Grid Y-Planes (Grid Wizard) • 24
Create Radial Cylinder (Grid Wizard) • 26
Create Radial Planes (Grid Wizard) • 28
cutting plane • 76

D

degree • 76
Delete a coordinate system • 41
Delete a grid line • 64
Delete a grid plane • 64
Delete elevation plane • 54

E

easting • 76
Edit a coordinate system name • 41
Edit coordinate system properties • 39
Edit elevation plane name • 54
Edit elevation plane properties • 53
Edit grid plane name • 63
Edit grid plane nesting level • 63
Edit grid plane properties • 63
elevation (grids) • 76
Elevation Planes Properties Dialog Box • 55
Export coordinate system • 33
Export Grids • 33

F

focus of rotation • 76

G

General Tab (Coordinate System Properties Dialog Box) • 42
General Tab (Elevation Plane Properties Dialog Box) • 55
General Tab (Export Grids Dialog Box) • 33
General Tab (Grid Plane Properties Dialog Box) • 65
General Tab (Import Grids Dialog Box) • 32
General Tab (Radial Grid Properties Dialog Box) • 72
grid • 76
Grid Line Properties Dialog Box • 67
Grid Plane Properties Dialog Box • 65
grid set • 76
Grid Wizard • 18
Grids • 7
Grids Common Tasks • 9
Grids Naming Rules • 12
Grids Workflow • 9
GUIDs • 76

I

Import and Export Coordinate Systems • 31
Import coordinate system • 31
Import Grids • 31
interference checking • 77

L

location • 77

M

Modify coordinate system bearing • 41
Modify elevation plane position • 53
Modify grid plane position • 62
Move a coordinate system origin • 40
move from point • 77
move to point • 77

N

node • 77
northing • 77

O

occurrence (of part or equipment) • 77
occurrence property • 77
origin • 77
origin point • 78
orthogonal • 78
orthographic • 78

P

PDS (Plant Design System) • 78
PinPoint • 78
Place a coordinate system • 38
Place a coordinate system by three points • 48
Place a grid plane • 60
Place a radial cylinder • 71
Place a radial plane • 70
Place Coordinate System • 35
Place Coordinate System by Three Points • 46
Place elevation plane • 52
Place Elevation Planes • 50
Place Grid Planes • 57
Place multiple elevation planes • 52
Place multiple grid planes • 60
Place multiple radial cylinders • 71
Place multiple radial planes • 70
Place Radial Grids • 68
Preface • 6
product structure • 78

Q

query select sets • 78

R

Radial Grid Properties Dialog Box • 72
reference data • 78
Regenerate grid lines • 64
Relationship Tab • 45
Rotate a grid plane • 61

S

Selecting Objects • 10
Settings Tab (Export Grids Dialog Box) • 34
Settings Tab (Import Grids Dialog Box) • 32

T

Transfer Ownership Dialog Box • 44

U

user attributes • 78

V

version control • 78
vertex • 78
viewset • 79

W

What's New in Grids • 6
wizard • 79
work content • 79
working plane • 79
workset • 79
workspace • 79